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Manuscripts sent for consideration should be typed double-spaced on one side of the paper only, with a margin of 1″ on the left and 1½″ on the right Headings should not be underlined References in the text to the work of other researchers should be made by giving the name of the researcher, and the year in which his research was published, in round brackets and not in the form of serial numbers which connect with the list of references at the end Typescript in duplicate should be sent to the editors, and at least one copy retained by the writer for reference

Tables, charts and graphs should be finalized carefully before sending They should be clearly and accurately captioned and inked to size and their places designated in the manuscript

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Manuscripts will not be returned unless the author so requests, in which case a stamped self-addressed envelope should accompany the manuscript

For manuscripts accepted, proofs will be sent to the author These should be checked and returned promptly to the Editor. If this is delayed, the manuscript originally sent will be considered to be final.

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ABBREVIATIONS

In the names of journals cited in references and bibliographies, prepositions and conjunctions have been generally avoided, and the following abbreviations have been used :

Abnorm.	Abnormal
Amer	American
App.	Applied
Bull	Bulletin
Canad	Canadian
Charac.	Character
Clin.	Clinical
Edu.	Education
Educl.	Educational
Engg.	Engineering
Exp.	Experimental
Guid.	Guidance
Ind.	Indian .
Monog.	Monograph(s)
Occup.	Occupational
Pers.	Personality
Personn.	Personnel
Psychol.	Psychology
Rep.	Report(s)
Rev	Review
Sec	Secondary
Soc	Social
Sociol	Sociological
Statist	Statistical
Stud.	Studies
Univ.	University

Education as a Discipline[1]

A. Mujib

A "discipline" in the generally accepted sense of the word means a field of study which has a well defined content and a technique of its own together with a unique system of values It is implicit in this concept of a "learned discipline" that it constitutes an important part of man's cultural heritage and that its pursuit results in a specific enrichment of the human mind. Most of the subjects taught in universities and colleges are "disciplines" in this sense. These have been traditionally accepted by the academic world and will continue to be accepted for some time to come.

When new directions of thought emerge from man's struggle with life and environment or through his creative mental efforts and acquire in time a degree of stability, a new discipline is born In its infancy the newly created discipline leans heavily on some of the well established disciplines, but during the course of its development it evolves its own distinct characteristics and acquires status in the intellectual world. Sometimes two or more branches of knowledge merge at their upper reaches, and this merger at the highest points works downwards to the lower levels and may even alter the whole pattern of the parent discipline or disciplines The newly evolved pattern sometimes proves its validity in practice and may become a nucleus for a new discipline. Biochemistry is one such case; geophysics and biophysics are others.

Alternatively, there may be a social or professional activity which on account of its importance becomes an area of application for several disciplines, and this common area in course of time may come to be recognized as an independent field of study Examples of such bodies of knowledge developing round an important professional or social activity are medical science growing round the art of healing, agriculture growing round the farmer's occupation, technology developing from craft, and education round teaching

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[1] A working paper for the Seminar on Educational Research held at Delhi on 14, 15 and 16 February 1966.

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When a number of disciplines converge into an important field of social activity, this activity gives a new meaning and a new life to the parent disciplines. An organic relationship, involving a two-way flow of ideas and resulting in the enrichment of both, is built up. The important thing to realize is that the necessary conditions for the growth of a discipline are freedom to develop new ideas, new syntheses, new horizons, and increasing opportunities to experiment with them. Conversely, conditions which lead to stagnation and decay are isolation, narrowness and restrictions on the free flow of ideas between the parent sciences and the newer discipline. These lead not only to a kind of intellectual sterility but also tend to impede the growth of the parent discipline.

EDUCATION AS A DISCIPLINE

Education as a social activity has had a theory and a practice almost since the dawn of history. It has been a particular concern of philosophers, religious thinkers and rulers throughout the ages. As a social enterprise, education draws heavily upon philosophy, sociology, psychology, anthropology, political philosophy, religion, medicine and several other related sciences and disciplines. In a sense, this complex of sciences and knowledge has been brought to a focus on the central problem of bringing up the young. During the course of time education has built up a structure of knowledge, a field of study and an area of investigation which are typically its own. It has branched out into fields of specialized study and research. It has a vast literature which is growing rapidly and continuously. It has contributed significantly to practically all the fields it has drawn upon. The contributions of education to psychology, sociology, philosophy, history and linguistics directly, and to such areas as engineering, medicine and architecture indirectly, may be considered noteworthy. It is in this sense that we speak of education as a discipline which may legitimately be classed as a social science. It is today a field of study which is wider, deeper, more comprehensive and of greater significance to human life and society than the professional training of teachers and the day to day problems of school administration.

A feature of education which must be emphasized is that it has grown into a discipline from the application of a number of other disciplines to one of the most important social activities, namely, educating the young and preparing the citizens of the future to man the entire machinery of production and to run and improve the various institutions of the country. In this context, even if the parent disciplines may originally have had a universal character, their confluence in the service of a national enterprise gives them a definitely national colour. By the same argument education as a social science must have an unmistakably national character

Education in a particular country must possess many features which have evolved in that country and bear the stamp of its particular social and economic conditions. The implication immediately is that while the sciences may be taken over in their entirety by any one country from another, education cannot be so totally borrowed It is this fact more than any other which makes it necessary for every country to build up its own education, both in thought and practice

THE STATUS OF EDUCATION IN INDIA

We in India have depended far too much and far too long on educational thinking and practice evolved in other countries in their particular social conditions, and it must now be recognized that the "why", "how" and "what" of education have to be determined and evolved by ourselves. We have paid insufficient attention to this important matter and it must be acknowledged that our educational practices, our ideas, our books and our approaches to the solution of educational problems are principally of foreign origin and hence perhaps generally ineffective in achieving the objectives which a correctly based education should have been able to achieve It is patently obvious that educational ideas and practices which were evolved in and for other climates will, in the long run, either run counter to our aspirations or confound educational outcomes

The anomalies created by depending almost entirely on outside sources are many and it is not difficult to point out situations where our education has missed its mark for this very reason. One glaring example, if we are willing to face it with honesty, is that educational psychology has, by and large, not functioned in the Indian classroom or outside it The reason is that all that we teach by way of educational psychology and all the textbooks we use were meant for teachers in American schools. It is not hard to realize that a child coming from the heart of old Delhi is different from a child living in New York and it should not surprise us too much if our educational psychology fails to stimulate the Indian teacher. The remoteness of most of the methodology of teaching from conditions obtaining in the Indian schoolroom is by now proverbial and hardly needs comment; suffice it to say that a classroom technique perfected in Winnetka will not work equally effectively in our schools. Principles of school administration so admirably suited to the American system of public schools do not apply with equal validity to privately managed schools in India, and few principals and heads of educational institutions, if any, ever consciously apply these in their administrative practice. Exotic schemes of improvement in various aspects of education have failed to make a dent in our system in spite of our best efforts to implement these. Examples can be multiplied, but for an audience like the present it hardly seems to be necessary. Indeed, our preoccupation with trying to work out ideas which are readily available from outside sources has stood in the way of our building up an education of our own.

THE TASK

The task, therefore, is to start building up an edifice of knowledge pertaining to education taken in its comprehensive meaning—an edifice of thought and practice which will be grounded in our national aspirations and which can vitalize and rejuvenate our thinking in all fields of educational effort. The work will pay in the long run and will help allay misgivings about our education which is causing nation-wide concern and dissatisfaction.

While the basic reason for our continued dependence on imported ideas is our general neglect, a contributory but none the less weighty reason has been the absence of a group of workers who could constantly enrich and rejuvenate educational thinking An appropriate set-up which would be actively engaged in producing men and material for the whole educational machine (and not just teachers) has also been lacking This group or body of workers would create and dispense knowledge at the highest level and would be in a position to inject vitality and realism into our education To give a crude analogy, these persons would build heavy machinery which could turn out machines which could produce goods.

Training colleges, as at present constituted, can hardly be expected to shoulder this responsibility, partly because their time and attention are fully occupied with training teachers and the duties which devolve on the staff in their day to day work as teacher educators are heavy There is another and more fundamental difficulty. The orientation of these colleges is professional and the persons involved are naturally more concerned with problems of a practical character. Further, by qualification, by outlook and by tradition, most of us tend to limit our horizon by equating education to the training of teachers, with the result that the wider perspective and the deeper implications often escape our vision. The closed shop policy which we as a professional group have adopted (admitting only trained teachers) has tended to act to the detriment of the enterprise as a whole, because it has effectively shut out the entry of healthful influences which scholars from other fields and cognate disciplines could bring to bear on education and which are necessary for the growth of educational thought.

It is therefore imperative that the closed door policy which we have hitherto followed be given up and scholars from other fields be encouraged to study education. This widening of scope is essential if we are to come out of the narrow groove into which we have fallen. The liberalizing influence of other fields and disciplines should be permitted freely to enrich our understanding of education in all its implications. A student of philosophy may become interested in education and its why and wherefore; a sociologist can perhaps better contribute to our understanding of how social forces affect education and are in turn affected by it; an expert in public health can study problems of school health; and, by the same token, problems of school finance may be better understood by economists and experts in finance who have made a special study of the monetary aspects of education. These are, among others, some of the areas in which workers from other disciplines can cooperate and contribute materially to the overall task of building up the edifice of education

By contrast, the present state of things is that the training college teacher is expected to perform all the above functions in addition to his duties as a person primarily responsible for training teachers This is obviously an impossible task and we should not be surprised if we teachers of training colleges are not able to handle the task to the satisfaction of society. Training colleges should concentrate their efforts on evolving and perfecting a system of training through which their alumni may be able to translate the ideals and aspirations of society into effective school practices They should be able to do so expeditiously, economically and with efficiency

PROPOSED ORGANIZATION

Once it is agreed that education as an edifice is to be built up on truly liberal and national foundations and that there is need to study and develop it up to the highest level, and it is further agreed that training colleges alone will not be able to handle the work, a set-up which will shoulder the task should be thought of. Centres with a function distinct from teacher-training, preferably working in close coordination with well established general colleges or universities, may be envisaged. Upward extensions of the better equipped training colleges which will have a professedly academic function is another possibility.

These centres will be staffed by scholars and students from all fields which are cognate to education, and will be chosen primarily for special knowledge in their own fields of specialization. It is, however, much to be preferred that these people be generally acquainted with the broader concept of education and be familiar with its general problems. It goes without saying that a diploma or degree in teaching cannot be insisted upon.

Another possibility is that university departments imparting instruction in the well-known and well established disciplines should 'adopt' particular areas of education, develop them as part of the parent discipline, and later offer courses of study in such areas. As an example, an enterprising department of economics can take up educational finance and make a study of the problems involved, produce literature, and later teach the subject as part of economics. Such an interdisciplinary approach is an important need and should receive serious consideration, because, in the nature of things, the task can be accomplished only by scholars in cognate disciplines working cooperatively. If we cannot do it for ourselves, who will and why should he?

NATURE OF WORK

The task broadly conceived is the extension of educational thinking and the creation thereby of a body of knowledge which may serve as a source and fountain-head of inspiration for all spheres of education, including the training of teachers This, it is submitted, is a primary national need Speaking again in broad terms, the study of "education" as a field of intellectual effort, in our circumstances today, may have the following broad objectives.

1. The study and pursuit of cognate disciplines and fields of study with a view to bringing out their full implications for education in the Indian context,

2. The study of specialized fields of work already chalked out by workers in other countries with a view to understanding their technique and methodology and developing our own material where needed;

3. The creation of new knowledge and literature relevant to ourselves and our needs;

4. Encouraging and involving workers and scholars in other disciplines to contribute to education.

In slightly less general terms the areas of work may be suggested as comprising:

1. Sociology and its bearing on education
2. Philosophy and education
3. Planning and finance

4. Political ideology and education
5. Study of education at all levels, professional as well as liberal, in other countries of the world
6. Public administration in relation to schools
7 Cultural anthropology
8. Psychology and its various applications to education, including its newer branches
9 History of education
10 School health
11 School architecture
12. Education of teachers
13 Any others

The list of areas of work and study presented above is purely suggestive and tentative.

TEACHING

A start may be made with the teaching of some subjects up to the highest level. Such teaching will encourage deeper and more exhaustive study and research in the areas concerned Priority in teaching may be given to subjects which will provide knowledge of techniques and methodology, or which can be studied with profit for their own value "Education in other countries of the world" is one such subject, the history of education and anthropology are others Subjects which are useful from the point of view of technique but with contents which are not heavily culturally loaded may also be taken up for teaching and investigation. Among these may be considered subjects like guidance, child psychology and psychometry.

Subjects like the sociology of education about which little or no material is available in India need more careful deliberation. It appears that simultaneously with teaching, efforts will have to be made to define its scope and content in the context of Indian conditions

This branch of educational theory should not be confined to enunciation of theoretical principles, but must base itself on the actual social relations obtaining in India Scholars of sociology in various universities may cooperate with educators to help build up useful literature in this area Sociology is a good example of a subject which needs to be developed before it can profitably be included in our syllabi The teaching of sociology, in whatever shape it exists in the country, is important not so much for the sake of teaching but for promoting the development of sociology itself.

RESEARCH

As has been pointed out earlier, our main task is to build up a structure and a fountain-head from which ideas will flow and enrich the entire field of education It follows that a major part of the programme will be research, study and development Much greater emphasis will have to be placed on research There are several fields of study which are in dire need of being worked out almost from the beginning Among these are educational administration, supervision, curricular development, and perhaps also others. The study of these subjects at the higher level should result in improved administrative practice and not merely in a knowledge of how others run and supervise their schools.

It is extremely doubtful if the study of educational administration at the higher level can be possible without a first-hand study of the administrative realities of Indian schools Experienced inspectors, principals and persons from public life may help in developing this very significant area of work in education.

Then there are other important areas which are almost untouched by scholars in this country. Among these are the psychology of childhood and adolescence, problems of students, teaching-learning processes, and others. Concerted and planned research in these areas may be encouraged

PRODUCTION OF LITERATURE

The paucity of suitable literature, both textbooks and source material, has been hinted at earlier. This should not be understood to mean that books and literature suitable for other countries are scarce. There is abundant material available from outside the country The point is that most of this literature is only of illustrative value and is not likely to be wholly relevant to conditions in this subcontinent Literature relevant to our work will have to be produced. This is a third function of the proposed centres of advanced study.

PREPARATION OF PERSONNEL

It is proverbial that training colleges attract students of relatively lower academic merit and since on account of our closed shop policies the staff of training colleges must be recruited from among the same basic human material, there is a real apprehension that in a decade or so our training colleges will be manned by persons who will not compare favourably with the staff in institutions teaching the other social sciences This danger can be effectively countered through personnel turned out by the proposed centres Not only training colleges, but also these centres themselves will require personnel for research, teaching and expansion

The institution of diplomas and degrees and the organization of teaching and research need not pose insoluble problems , the usual set-up so well established in India is workable The first stage and the ground for the second stage are already prepared. Some universities have allowed education as an optional subject for the first degree; honours courses and courses leading to a master's degree, which in turn may lead to a doctor's degree, should be set up These courses should be open to all students and few, if any, restrictions need be imposed. Where possible, related subjects may be included under the classical disciplines and taught under their own auspices

There is nothing entirely novel or revolutionary in the proposals outlined in the foregoing presentation. Many schools of education in the U S.A , and lately some in U K , have made it possible for all who wish to study education to do so without making it obligatory for them to first become members of the "guild of trained teachers" Eminent psychologists, anthropologists, statisticians and sociologists, scholars of history and other social sciences, and workers from such fields as linguistics, public health, public administration have taken active interest in and have made significant contributions to various aspects of education Quite a few are associated directly with schools of education in the capacity of teachers and research workers and are contributing in no insignificant manner to the overall growth and enrichment of education taken in its wider and comprehensive meaning Perhaps we can also do the same.

In essence, the plea is that (a) education be understood as a social science with an unmistakably national colour and with a content designed to serve national ends, and not be identified with teacher-training; (b) it should be realized that for historical reasons our dependence on ideas, theories and practices of foreign origin has tended to dwarf our vision and has hampered the development of an educational structure on truly national foundations; (c) education as a social science can grow and develop into a truly national edifice only from the confluence of other disciplines and social sciences whose active support must be obtained.

The enterprise as envisaged in these pages will require patience, sustained effort, encouragement and, above all, the will to undertake it. Perhaps the time to begin is now

A. Mujib is Head of the Department of Education, Aligarh Muslim University, Aligarh.

The Development of Educational Research — Some Considerations[1]

Shib K Mitra

Educational research in India is of fairly recent origin. This is not surprising because the study of education as a subject at the university did not begin seriously until the forties. As compared to the sciences and humanities, however, education has not formed a significant part of academic life in a university In this respect it has followed the path of other professional subjects like medicine, engineering and law But unlike these education has not grown in status and organization and, what is worse, has failed to develop an identity of its own. It has remained very much a teacher-training programme. (One does not think of lawyer-training or doctor-training in a similar way.) It is against this background that one has to judge educational research, and one will not perhaps in that case view very unfavourably the little that has been done in educational research in India. Indifferent attempts have been made to measure teaching aptitude and students' achievement in various grades and subjects and to prepare some measuring devices. It is, however, worth noting that there is evidence of some good research

Education, in the sense of educational activities in institutions, is at the cross roads in India, as much as it is elsewhere The problem of choice, however, is more difficult for a developing society, where the challenge is to cover in twenty years a gap of fifty years or more between the developing society and the affluent ones in science, technology, agriculture, production and management Bread and butter demand, if not the beacon light of a utopia, that India takes the right decision at the cross roads. The decision luckily is not to be taken once and for all, nor is it as simple as the analogy of turning at the cross roads would imply. Decisions may have to be taken very frequently, for the path to progress is tortuous. But the price of each wrong decision is high. In such circumstances a man is guided by the light of reason, and not merely by his eyes and legs. Educational development similarly has to be guided by research The rate of expansion of educational research should be fast enough at least to keep pace with educational development, for the guide must walk with the guided, if not a little ahead. Otherwise, let educational research languish in the by-lanes of a university.

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[1] A paper for the Seminar on Educational Research held at Delhi on 14, 15 and 16 February 1966.

In attempting to discuss what research needs to be done, one is frequently bogged down by an implicit assumption that educational research must grow out of the theory and methods of education as an academic subject or discipline, analogous to the growth of research in the sciences This assumption is not necessary. Education as a subject of study has more of the characteristics of technology than of science, and so it should borrow the concepts, methods and tools of any science that helps in researching on educational problems. These problems have to be formulated clearly in terms of research using the methods of one or more sciences. It will not be right, however, to impose on education a problem which rightfully belongs to science. In reaction, it will be wrong on the part of the education wallah to insist upon the growth of educational research from educational theory and methods. Therefore, in deciding upon the areas in which research should be undertaken, it will be well to keep in mind the characteristics of education as a technology, and not a well developed technology at that

As a technology, it is the educational process called teaching-learning which is central to education. The rest of education is concerned with the production, distribution and management of persons, techniques and aids required to keep the educational process going. Research should, therefore, focus on teaching-learning This is precisely what has happened in the Soviet Union and the U S A. We need not do the same thing just to emulate big brothers, but because it is the central problem of education in the country. In the millions of classrooms in our schools, colleges and universities, it is this educational process that is supposed to take place six days in the week The word "supposed" is used deliberately. The implication for research is obvious. Whether the field is psychology, sociology, communications, engineering or economics, it really does not matter, so long as research attention is focussed on teaching-learning If the teaching-learning processes cannot be understood, we may as well give up talking of educational research It is only by knowing thoroughly and by experimenting that the educational process can be improved. And nobody will say that it does not need improvement *Ad hoc* approaches based on preconceived notions will not solve any educational problem. Such attempts will only make a mess of the thing, as has happened in the past. Both fundamental and applied research have to be done.

DEVELOPMENT OF EDUCATIONAL RESEARCH : SOME CONSIDERATIONS

Teaching, it has been said, is an art. So is learning. And like all art, therefore, it is doing rather than being Once teaching and learning are defined as behaviour, it becomes possible in research to think, identify, isolate, measure, and manipulate a number of variables which produce this behaviour and maintain it at a certain rate with a certain efficiency. Some of these variables are in the persons most directly involved, namely, the teachers and the pupils Others are in the persons around them—in individuals and in groups, in formal and in informal relationships Still others are in the society or the community, in the organization called school or college or university, in the bureaucracy that manages this whole show Some may be in the books, aids, curriculum and evaluation. By centering research on teaching-learning and focussing on manipulable variables, we shall know considerably about all the significant factors in education which can be controlled relatively easily to improve teaching-learning. (Now, with high speed electronic computers, multivariate models could be used, this was practically impossible some years ago.) Thus, such research will have immediate implications for teacher education, for we shall then know what teacher behaviour produces learning of a desirable kind, and shall train our teachers to produce that behaviour in the classroom, and so organize our school system that such behaviour is reinforced. So long as we do not understand what teaching-learning is, the goals of teacher education, its content and programme, will remain a noble but frustrating, if not useless, endeavour.

Much of the research on teaching-learning is fundamental research and is primarily psychological. But there are many applied problems of teaching-learning as well The possibilities offered by programmed learning in single-teacher schools, in schools with untrained or poorly trained teachers, in teacher-training and adult education, have to be explored. For the talented and the backward (both pupils and teachers) programmed learning has to be tried out Besides programmed learning, it is necessary to discover for each level of education that combination of programmed learning books, audio-visual aids and other curricular and evaluation materials, which will yield maximum learning for a fixed cost Such research will be decision-oriented so that the decision-maker may only take calculated risks.

All educational research is obviously not research on teaching-learning. There are many other problems, both basic and applied, which need research Thus, tool development is a major area. So is the basic problem of character development and change in knowledge, skills, abilities, interests and attitudes over the entire school and college years There are pressing problems of language learning What languages should be learnt, at what age, in what combination, what doses, with what effects on later learning and on development of abstract thinking? One may like to solve the problem of when schooling should start, at what age and with what subjects, and how it should proceed over the years of development, at what rate, with what main and side effects The problem of determining the age at which diversion from the main stream of education into technical, vocational and agricultural channels, etc., should be provided is as important as the problem of the work-centered curriculum and its effects on knowledge, habits and character Teaching-learning is involved in each one of these problems. Depending on the preference of the researcher, it may be the main focus or a subsidiary research aim. The burden of this paper is that teaching-learning has too long been taken for granted and idealized, and that it is time we began to question it and change it for the better Herein lies the challenge of a developing society with its millions clamouring loudly for prosperity through education. If a breakthrough has to be made in education, it should be at the barrier of teaching-learning in the classroom.

Education in a modern society has taken on an aspect which is very much like industry. It is concerned with the production and distribution of knowledge Any modern society has to ensure the production of new knowledge as well as the distribution of knowledge, both old and new By knowledge we mean the entire range, from factual information about hair styles to the most abstract speculations about life in outer space and what may be called outer time, that is, the after life. The processes of democratization, urbanization and industrialization have created certain forces in society today which make it difficult even to imagine any restriction on the "knowledge industry" Like any other industry, therefore, this knowledge industry has its problems of raw material, processing, storage, retrieval, wastage, surplus, marketing, etc. The managers of this industry are as much concerned with management problems as those in any other industrial area It may hurt one's feelings to view education in this light But a poor country can ill afford to harbour illusions or a nostalgia for the bygone days of the noble teacher under a banyan tree Educational planning and administration treat this aspect of education as an industry in any case, for they have to look at education from the point of view of the state and the society. Educational research should therefore be directed to this aspect also so that the return on investment is maximized. The policy for educational research should thus be to encourage a two pronged attack· on teaching-learning processes and on the "knowledge industry".

It is relatively easier to think of research strategies and problems than of the resources for research The lack of good educational research has been due to a lack of resources Resources of men and money have both been meagre Unless these resources increase considerably, there is little hope for the growth of educational research Investment in research has to increase considerably. The proportion of the central and state budgets allocated for research is very small indeed. The exact figures on this are not available, but it may not be too far off the mark to suggest that at the state level the figure is somewhere around 0 1 per cent of the total budget for education The same will perhaps be true of the total budget for post-graduate education in the universities, it may perhaps be even less

It is necessary to allocate at least five per cent of all research funds in universities for educational research, and at least one per cent of the state education budget. Research being a central subject, perhaps the states may not like to spend one per cent In that case the Union Ministry's budget should set apart the money required to make up this one per cent at the state level.

Financial resources may not be the real bottleneck in the development of research. It is more in the area of human resources that we shall have difficulties. Our shortage of well trained researchers cannot be met all at once. In order to meet this shortage, it is necessary to attract researchers from other disciplines and institutions and strengthen the Ph.D programmes in education in several universities as well as in the National Institute of Education Another way, besides training, would be to develop organized research Leaving aside a few outstanding researchers in any field, who might follow the path of the lone wolf with profit, the quality and quantity of research is likely to be better if the rest of the researchers can join in teams for specific research projects. Cooperative research has just begun in India and it should increase. It means organization, it means giving up certain privileges and freedoms, but it is more productive and satisfying in the real sense and in the long run. What one cannot achieve in isolation, one may achieve in company

In order to attract talent, it is necessary to provide fellowships Perhaps one has to think a little more radically in such matters It will be worth considering whether fellowships should not be instituted at the highest level, that of professor, so that a senior person can spend three to five years on research alone.

In the long run, the supply of trained personnel can be ensured only if some 10 or 15 institutions in the country are developed to offer a sound Ph D. programme as well as in-service training and to undertake cooperative research, and if these get National Institute of Education fellowships Actual research, however, can develop only in a few centres.

Even with the existing resources better results can be achieved by a proper organization of research. A department of education or a college offering the M Ed programme, in which a dissertation has to be submitted, may get together with neighbouring institutions and decide on a few salient problems of research broadly conceived. The research guides may then form a group to analyse these problems into smaller, specific research problems, logically interlinked These may be apportioned by the guides among themselves The students under a particular guide may work only on those specific problems which he is handling If the group continue to meet occasionally and interchange notes on their experience and suitably modify or elaborate or restrict their plans, it should be possible through M Ed dissertations alone to build up a sizable body of knowledge in a given area over a period of five to ten years.

One cannot, however, be too optimistic about the future of educational research, if it remains confined, as it is today, to the narrow boundaries of teacher-training institutions. It should be possible, though, to involve the social scientists in the universities at various levels and stages of educational research. Such interdisciplinary collaboration will not only be stimulating to the researcher; it may gradually create a climate of original thinking in education. By producing tested knowledge and precise information through such collaborative efforts, it should be possible also to influence the direction of decision-making in educational development.

Shib K. Mitra is Head of the Department of Psychological Foundations, National Council of Educational Research and Training, New Delhi

An Investigation into the Organizational and Administrative Factors Which Affect the Achievement of Pupils in Secondary Schools[1]

N P. Pillai

An investigation to find out the non-instructional factors affecting the achievement of candidates appearing for the Secondary School Leaving Certificate examination in Kerala was undertaken in 1963. It arose out of a felt need The discontent bred by wastage and stagnation and by the sub-standard quality of those who passed the S.S L C examination was vehemently voiced from the platform by politicians and educationists. The cry against falling standards gradually became a cry against teachers, and it was not seldom that they were condemned in public for their inadequate qualifications, inefficient work and colossal negligence of duty. The Government of Kerala took notice of the situation and as one of the steps to arrest falling standards, decided to penalize teachers who did not produce satisfactory results at the S S.L C examination. This created a furore and while many of the teachers did work harder with a view to bettering the achievement of their pupils, they were terribly agitated over the decision which made them solely responsible for poor results as they felt there were several other reasons for it

There existed no authentic data to show that results depended entirely, or at least largely, on the work of teachers, nor were there any data readily available to show which other factors affect the achievement of pupils We felt that this was a problem which needed immediate investigation It was expected that an investigation into the organizational and administrative factors which we felt affected the achievement of pupils in secondary schools would reveal the inadequacies in the schools, against which teachers felt helpless, as well as inadequacies in respect of the home conditions and interests and aspirations of the students whom they taught If these factors did not vitally affect the achievement of pupils, the teachers could certainly prevent the large number of failures by putting in more efficient work Otherwise it would be unfair to lay the entire blame on them.

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[1] The investigation was conducted with a grant from the National Council of Educational Research and Training, New Delhi

PURPOSE

The major objectives of the study were.

(i) To find out how adequately schools are equipped for instruction and how far the proper atmosphere and incentives are provided for securing achievement;

(ii) To find out how far achievement depends on factors other than instruction;

(iii) To find out the relative achievements of pupils in well equipped and ill equipped schools; and

(iv) To suggest ways and means of improving standards.

METHODOLOGY AND INVESTIGATION

THE HYPOTHESIS

Broadly, the hypothesis on which this investigation proceeded, was teachers can do efficient work and raise standards of achievement only when the conditions conducive to intensive work are at the optimum. These conditions can be divided into two categories· conditions inside the school, which lie within the control of the school authorities, including the headmaster, the management and the Government ; and conditions outside the school, i e , factors which are totally outside the purview of the teachers

Conditions within the school

In many schools, consequent on the policy of universal primary education, the classes are today overcrowded Teachers, however efficient they may be, cannot be expected to know every pupil in a crowded class and to bestow personal attention on him. In several places classes are conducted in temporary sheds without any partition between class and class and without an adequate number of benches and desks or a good library or laboratory Guided reading and self-study are practically non-existent in school

The lack of the full complement of the members of the staff during the early months of each academic year is another serious complaint The strength of the staff is fixed only towards the second academic month, as it is only by the end of the first month that the department gets information from all the schools regarding the number of pupils in each class. Substitutes are not appointed in several of the leave vacancies.

In many schools facilities to enable teachers to sit and work during leisure hours are not provided. This makes preparation for teaching and proper correction of pupils' work impossible No teacher can work efficiently unless the minimum conveniences such as at least a teachers' common room and a table and a chair for every teacher are made available

Conditions outside the school

The educational status of the parents and the other members in the family, the number of school-going children in the family and in the vicinity, and the occupational status of the parents exercise a direct influence on the aspirations of the children and determine how much guidance and help they can get in their studies. Facilities such as a separate room for study, books and other necessary materials, and timely help in the form of private tuition and guidance are often available only to children with educated and well-to-do parents A school which draws its population mainly from this kind of social background must naturally produce good results. In such schools, if the results are poor who else is to blame except the teacher?

The questionnaire and the data sheet were, therefore, prepared with a view to collecting data concerning:

(i) The situation of the school in the community

(ii) Accommodation

(iii) Teaching staff

(iv) Human relations

(v) Community-school relationships

(vi) Pupil classification

(vii) Inter-pupil relations

(viii) Social work routine

(ix) Pupil personnel services

(x) Play and other recreational activities

(xi) Motivational factors

(xii) Methods of assessing achievement of pupils

(xiii) Equipment

(xiv) Annual examination marks of pupils

(xv) Attendance and health

It was hoped that the analysis of the data would bring out

(i) The conditions which exist in schools which have produced uniformly good results,

(ii) The conditions which exist in schools which have produced uniformly poor results, and

(iii) Whether achievement depends upon mere instruction or also on one or more of the non-instructional factors mentioned earlier

THE INVESTIGATION

The sample

At the time of this study there were 1,008 high schools in Kerala grouped for administrative purposes into 20 educational districts It was not considered feasible, within the short time available, to take a sample of schools from all these districts; hence it was proposed to select the sample for this investigation only from one educational district, namely, Trivandrum. Excluding incomplete and unaided schools, this district then had 19 government schools and 34 private schools. Of these, 24 schools were selected. This sample yielded 12 government schools and 12 private schools, 12 urban schools and 12 rural schools, 8 boys' schools, 8 girls' schools and 8 mixed schools Nine schools in the sample had been producing consistently good results and seven schools consistently poor results, while the remaining eight had produced fairly good results in 1963 but not earlier In March 1963, a total number of 8,135 pupils had appeared for the S S L C examination from Trivandrum District; of these 2,257 belonged to these schools Thus the percentage of pupils selected for investigation was 27 7

The questionnaire

The questionnaire contained 61 items relating to a pupil's marks in the school and S S L C examinations, the time spent in going to and returning from school, parental interest in the education of the pupil, the family size, details about the other members of the family, leisure time activities, facilities in the school, home work, class tests, composition work, the pupil's attitude towards school life, the type of punishment in the school, attendance in school, co-curricular activities, progress reports, etc

The questionnaire was intended to be answered by all the pupils of the selected schools who took the S S.L C examination in March 1963 2,201 questionnaires were supplied to the schools Of these 1,408 were returned. After a careful scrutiny, 1,130 questionnaires were selected for analysis

The Data Sheet

Several factors which could be termed non-instructional remained unrevealed even after the questionnaires were scanned. It was also necessary to cross check the information collected through questionnaires. With these aims, an instrument for an intensive survey of the equipment and facilities in each of the selected schools was prepared in the form of a Data Sheet The proforma was to be filled directly from school records and, wherever necessary, corroborated by interviews with the teachers and headmasters. The proforma was aimed at collecting information regarding the management of the school (government or private), locality (rural or urban), type of school (boys', girls', or mixed), when it was founded, the number of sections in each class, pupil strength, area of the compound, distance from neighbouring schools, number of classrooms, nature of school buildings, availability of separate rooms for the headmaster, teachers and office staff, library, laboratory, audio-visual aids, N C C , A C C , N D S , craft work, assemblies and meetings, tiffin-room, number of graduate teachers (trained and untrained), language teachers (trained and untrained), teachers with higher qualifications, sanctioned strength of teachers, pupil-teacher ratio, work load of teachers, leave taken by teachers, number of pupils belonging to scheduled castes and tribes, number of scholarships and fee concessions, test papers, progress reports, cumulative records, basis of promotion in high school classes, percentage of passes in 1960-61, 1961-62 and 1962-63. furniture, equipment, area of playground, physical education work, marks in annual examinations, percentage of attendance, staff association, number of visits made by inspecting officers, steps taken to secure the cooperation of parents. types of punishment, basis on which class sections were formed, and non-teaching staff.

As a result of the analysis of the data collected through the proforma a clear picture of each of the selected schools was obtained A summary of the important findings is given below.

Findings

In the urban areas the schools were situated very near to each other, but the rural schools (excepting bifurcated schools) were at a distance of at least two miles from one another. The total pupil strength varied between 149 and 2,194 and the strength in Class X varied between 12 and 287 in these schools The average size of a class ranged from 12 to 45 In 14 schools, classrooms were adequate for instructional purposes Due to lack of accommodation three of the schools were being run in two shifts. Generally speaking, space was scarce in every school for the increasing number of pupils being admitted Temporary sheds had been erected in a large number of schools Some of the semi-permanent buildings had neither walls nor partitions Separate teachers' rooms for men and women teachers were provided in nine schools, while in eight only a common teachers' room was available for the teachers. No teachers' room was provided in at least two schools. Only eight schools had properly equipped laboratories In seven schools, no separate library room was provided. N C C. or A C C was organized in eleven schools and at least one room was set apart for this. National Discipline Scheme instructors were appointed in most schools but were observed to carry on with physical education as well, in the absence of separate physical instructors. The number of teachers in the high school section varied from 6 to 49, while the number of trained graduate teachers varied from 3 to 29 The percentage of trained graduate teachers ranged between 66 and 100, which shows that no school was badly lacking in fully qualified teachers The teacher-pupil ratio ranged between 1.32 and 1 20 It was noticed that during the earlier academic months teachers had a heavy work load due to shortage of staff Appointments and transfers following the fixing of staff strength were invariably made only long after the academic session commenced One interesting fact noticed during the analysis was that the average number of casual leaves taken by the teachers in different schools varied between 6 and 14 (Teachers are eligible for 15 days of casual leave in the year) The maximum percentage of pupils belonging to the scheduled castes and tribes was 30 Only three schools claimed that they were maintaining some form of a cumulative record. Most of the schools were issuing progress reports twice a year In 16 schools marks secured in the terminal examinations were also considered in deciding the promotions, while in the remainder promotions were based on final examination marks. In eight schools, the benches and desks were insufficient in number The position in this respect was better in private schools than in government schools Only five schools had good laboratories. Audio-visual aids had been provided in all the schools. All the schools had libraries and the total number of books in each varied between 719 and 12,263 A healthy development noted was that in most schools, prizes, medals and scholarships were being awarded to motivate pupils to pass examinations No school was completely devoid of co-curricular activities like literary associations, sports and arts clubs, etc Eleven schools had parent-teacher associations. Medical inspection had not been carried out efficiently in any school Absence from school, so far as pupils of Class X are concerned, can be due to unavoidable causes; in all schools the percentages for attendance were above 94 per cent

The Weightage Score Sheet

(I) Categorization of different Items Into groups

After tabulation of the data collected through the questionnaires and the Data Sheets, the various factors that were expected to play some part in the determination of achievement levels were grouped into three categories.

1. Teacher factors or instructional factors
2. Social and educational conditions, or environmental factors
3. Organizational and administrative factors, or non-instructional factors, in schools.

The components of each of the above factors are enumerated below:

Instructional factors

(i) Composition work
(ii) Exercises and home work
(iii) Periodical tests
(iv) Evaluation of tests
(v) Issue of progress reports
(vi) Holding extra classes
(vii) Giving special attention to examination subjects.

Environmental factors

(i) Time taken to reach the school
(ii) Educational status of parents
(iii) Availability of separate room for study
(iv) Study habits
(v) Availability of tuition at home
(vi) Interest taken in films
(vii) Provision for noon meals
(viii) Attitude towards school
(ix) Attendance at school
(x) Average monthly income of parents.

Non-instructional factors

(i) Laboratory facilities
(ii) Provision of audio-visual aids

(iii) Library facilities
(iv) Parental cooperation
(v) Keeping cumulative records
(vi) Awarding prizes and medals for academic distinction
(vii) Nature of punishments
(viii) Facilities for sports and games
(ix) Literary and other school associations
(x) Size of the class section in Class X
(xi) Classroom accommodation for Class X
(xii) Facilities provided for correction work to teachers
(xiii) The number of qualified teachers in the school
(xiv) Frequency of transfer of teachers
(xv) Promotion criteria in the lower standards

(ii) Formulation of the Weightage Score Sheet

For the purpose of statistical treatment it was found necessary to quantify all items to be considered, by assigning weights to the various factors. This work was done with the cooperation of the experienced members of the staff of the University Department of Education, the headmasters of the city schools and some of the senior teachers The maximum weight was fixed at ten Weights for all items were to be assigned by each of the questionees based on the importance he or she attached to the particular aspect These weights were tabulated and converted into single weights for each item. The weights so ascertained were then discussed with the questionees and confirmed In the weightage score sheet the item "income of parents" was omitted because proper weights could not be arrived at without going through the family budgets But this omission did not in any way affect the analysis since almost all the other items depended on the income of the family Hence the influence of this item was indirectly taken care of in the analysis A special study relating to this item has, however, been made separately

(iii) Classification based on the Weightage Score Sheet

The instructional and non-instructional scores of all the schools were found out using the final scores fixed for the various items. The total of all weights for items coming under the non-instructional factor is the non-instructional score of the school The instructional score for each school and the environmental score for each pupil were similarly calculated

STATISTICAL ANALYSIS, INTERPRETATION AND CONCLUSIONS

RELATIONSHIP BETWEEN ACHIEVEMENT AND FACTORS

Table 1 contains the school average (%) in the S S.L.C. examination (Y), the non-instructional score (X_1), the instructional score (X_2), the average of the environmental scores of pupils studying in the school (X_3), and the average $\frac{X_1+X_2+X_3}{3}$ of X_1, X_2 and X_3

TABLE 1

	Y *Students' Average Mark in March 1963*	X_1 *Non-instructional score*	X_2 *Instructional score*	X_3 *Average of students' environmental scores*	$\frac{X_1+X_2+X_3}{3}$
A	366	63	43	37	48
B	293	44	50	34	43
C	376	74	43	40	52
D	273	55	43	27	42
E	276	34	48	34	40
F	330	67	43	34	48
G	415	53	45	42	50
H	306	33	43	31	36
I	278	63	46	26	45
J	263	64	41	32	46
K	289	44	46	35	42
L	415	61	45	38	48
M	263	57	50	38	48
N	276	58	46	30	45
O	373	51	48	40	46
P	273	63	43	33	46
Q	304	73	43	26	47
R	305	50	43	32	42
S	391	67	48	37	51
T	354	70	48	35	51
U	280	65	43	34	47
V	239	40	50	33	41
W	303	56	48	29	44
X	218	48	41	31	40

An idea of the relationships existing between the Average Mark (Y) and the various factors can be had by plotting the points $(\frac{X_1+X_2+X_3}{3}, Y)$, (X_1, Y), (X_2, Y)

and (X_3, Y) on graph paper The chart of $(\frac{X_1+X_2+X_3}{3})$,Y will show an upward trend indicating the effect which the three factors on the whole are exercising on the achievement of pupils. Graphs of (X_1, Y) and (X_3, Y) also show upward trends indicating the influence of the non-instructional and environmental factors Comparing the slopes of lines around which the points in these two graphs cluster, it can be seen that pupils' environmental factor exerts the maximum influence The graph of (X_2, Y) presents a different picture. It does not indicate any definite trend. Many schools have instructional scores 43 and 48 and the two groups of schools are more or less similar in achievement. In both groups there are schools with good results and schools with poor results The variation of the instructional score (X_2) is very small as seen from the following figures Var (X_1)=128, Var (X_2)=8. Var (X_3)=18 The sample does not include much variation so that we cannot arrive at any definite conclusion regarding the influence of teaching Either the quality of teaching is almost the same in all schools or our sample is not a representative one in this respect. It may be interesting to study the variation in the quality of teaching in the schools of Kerala For this the sample schools must be taken after proper stratification with that end in view.

A closer study of the charts reveals the existence of interaction between factors. The factors do not behave independently If they are independent, then, for example, a school with a good non-instructional score must always be better than a school with a comparatively poor non-instructional score. But this is not always the case. The difference in achievements also depends on the presence of the other two factors.

ANALYSIS OF VARIANCE TESTS

To test the significance of effects and interactions of factors, analysis of variance tests were conducted From the frequency distribution of the environmental scores of 1,130 pupils it was estimated that nearly 25 per cent of the pupils had scores less than 25, 50 per cent between 26 and 40, and 25 per cent above 40. The scores corresponding to these three categories are classified as poor, average and good respectively. Similarly, on the basis of the frequency distribution of the non-instructional scores, they are classified as poor (scores less than 60) and good (above 60), such that nearly 50 per cent of the schools belong to each group. Also, the schools are classified with respect to the instructional scores. Schools getting instructional scores below 45 are considered poor, and others good. Finally, the pupils are classified according to their environmental scores and the instructional and non-instructional scores of the schools in which they were studying.

Thus a three-way table with 12 cells is formed The frequencies in the cells are as follows

TABLE 2

Non-instructional score	Good			Poor		
Instructional score	*Environmental Score*					
	Poor	*Average*	*Good*	*Poor*	*Average*	*Good*
Good	43	103	88	92	194	118
Poor	63	192	87	38	90	17

To carry out analysis of variance for the above table with such disproportionate frequencies is very tedious Hence a sample is taken from each cell so as to make the proportion 38 90 17.

TABLE 3

ANALYSIS OF VARIANCE

Source	*Sum of squares*	*D F.*	*M S S*	*F*	*Remarks*
Total	4510173.1	579		(at 5% level)	
Between Cells	945115.1	1			
Non-instructional factor	395780.6	1	395780.6	63	Significant
Instruction	217862.6	1	217862.6	35	,,
Environment	211635.5	2	211635.5	17	,,
Non-instructional × Instruction	26264.1	1	26264.1	4,2	,,
Non-instructional × Environment	83962.8	2	41981.4	6.7	,,
Instructional × Environment	9561.7	2	4780.8	1	Not Significant
Non-instructional × Instruction × Environment	47.8	2	23.9	1	,,
Error	3565058.0	568	6276.5		

The interaction between the non-instructional factor and instruction and that between the non-instructional factor and the environment of pupils are significant while that between instruction and environment is not significant. Since two interactions are significant the table is split up to study the effects of each factor for various combinations of the other factors.

From the separate analysis of variance tests the following inferences are drawn .

(i) The effect of instruction when the non-instructional score is good or poor is significant Comparing the effects of instruction in schools with good and schools with poor non-instructional scores, it is seen that good teaching has better effects if the non-instructional factor is good Good teaching has an effect of 52 units on the achievement of pupils in schools with good non-instructional scores and only 25 units in the case of schools with poor non-instructional scores

(ii) As with instruction, the effect of environment is more pronounced when the non-instructional score is good

The effect of the non-instructional factor is significant only when the instructional score is good and the environmental score for the school is average or when the instruction is poor and the environmental score of the school is average. Of these two effects the former is higher The various effects estimated are given below.

TABLE 4

	Good non-instructional score			*Poor non-instructional score*		
Effect of instruction	52			25		
Effect of environment	68,0			12 30		
	Good instruction			*Poor instruction*		
	Environmental score					
	Poor	*Average*	*Good*	*Poor*	*Average*	*Good*
Effect of non-instructional factor	Nil	82	Nil	Nil	57	Nil

The effects are estimated by the differences between the average S.S.L C. examination marks. The effect of environment is represented by two figures, one corresponding to the difference between the poor and average groups and the other corresponding to that between the average and good groups.

SOME SPECIAL STUDIES

Since the factors do not behave independently, the study of individual items may be misleading. However, because of their relative importance certain items are studied in more detail. No attempt has been made to estimate their effects, since such estimates without eliminating the effects of other factors are useless

Qualified Teachers

TABLE 5

School No	*Average Mark*	*Percentage of trained graduate teachers*
A	366	100
B	293	100
C	376	96
D	273	95
E	276	88
F	230	100
G	415	100
H	306	100
I	278	93
J	263	100
K	289	95
L	415	100
M	263	90
N	276	80
O	373	100
P	273	81
Q	304	100
R	305	85
S	391	85
T	354	100
U	280	85
V	239	68
W	303	83
X	218	66

In all the 24 schools more than 65 per cent of the teachers are trained It is interesting to note that among the nine schools in which all the teachers are trained, some produce very good results and the others very poor results But in all the top ranking schools more than 85 per cent of the teachers are trained. A general impression we get from these data is that trained teachers do influence the results in schools.

Tuition at home

TABLE 6

	No. of pupils with tuition at home	*No. of pupils without tuition at home*	*Total*
No passed	127	455	582
No. failed	71	482	553
TOTAL	198	937	1135

Of the pupils who had tuition at home 64 per cent passed, while of those who did not, only 50 per cent passed In the sample only 198 out of 1,135 (i e , 17 per cent) pupils could afford to have tuition at home.

Average monthly income of the family

The average monthly income is calculated by dividing the total income by the number of members in the family

TABLE 7

	Less than Rs 50	*Rs 51-100*	*Rs 101-200*	*Rs 201 & above*	*Total*
No passed	161	123	79	164	527
No failed	333	89	46	21	489
TOTAL	494	212	125	185	1019

The percentage of passes in the various income groups are 33, 58, 63 and 89 respectively. This is a clear indication of the positive relationship between the percentage of passes and the average income of the family Nearly 50 per cent of the pupils came from families with an average income of less than fifty rupees and of these nearly 67 per cent failed Pupils from families with an average income of two hundred rupees and above constituted only 18 per cent and among them the percentage of failure was only 11 per cent.

Educational status of parents

The education of the father or mother, whichever is higher, is taken to represent the educational status of parents

TABLE 8

	Illiterate	*Studied up to primary level*	*Studied up to secondary level*	*Studied up to degree level*	*Total*
No. passed	38	93	286	153	570
No failed	98	195	222	21	536
TOTAL	136	288	508	174	1106

The percentage of passes in these classes are respectively 28, 32, 56 and 88. The illiterate parents constitute only 12 per cent. The percentage of failure in this class is as high as 72. The percentage of failure among the boys and girls of parents who are graduates is only 12 per cent. A good educational background in the family is definitely an advantage to the pupils

CONCLUSIONS

Generally speaking, conditions in the schools are not satisfactory with respect to many essential facilities such as a library, laboratory, etc In some schools even the buildings are not adequate: others do not have sufficient space for conducting classes. Some schools are not properly equipped with benches and desks. Even though all schools purchase books for the library, in some the pupils do not benefit much from these books because the school either does not have a room exclusively for the library or a whole time librarian. All schools have laboratories, but some do not possess equipment sufficient for a high school. Audio-visual aids are rarely utilized Fairly good facilities for sports and games are provided in all schools.

Although the maximum influence is exerted by the environmental factor, the effect of the non-instructional factors is also considerable The presence of interaction between the various factors, however, is more important than their effects. Because of this interaction, good instruction becomes more effective when the school has such facilities as a good laboratory, literary and other clubs, audio-visual aids, etc Similarly, when the majority of the pupils come from an environment of poverty, results cannot be improved even with good teaching and proper facilities in the school This is one of the most important facts revealed by the study The influence of the home on the pupil is established beyond doubt by the analysis of variance tests and the special studies relating to tuition at home, the average income of the family and the educational status of the parents.

SUGGESTIONS

It was found that the results in many schools were badly affected by the lack of facilities for promoting the proper teaching-learning process. The very first suggestion therefore is that the classrooms must have a sufficient number of benches and desks. Further, proper facilities should be provided to enable pupils to derive the maximum advantage from the library, laboratory and audio-visual aids The appointment of a librarian may help to distribute books regularly among students, and if adequate space and seating arrangements are provided in the library, guided and supervised study could be introduced Again, the quality of instruction depends greatly on qualified teachers and the facilities given to them In some schools such facilities were lacking The teachers complained that they did not have rooms in which they could sit and relax or correct composition work during leisure hours. In fact, in some schools composition work and periodical tests were not given much importance. The study reveals that the schools where proper care was taken regarding items such as composition work, periodical tests, issuing progress cards, etc., were above the other schools in achievement. It is gratifying to note, however, that the quality of teaching maintained a certain standard and there was not much variation among the schools of the sample in this respect.

Adequately equipping the schools and improving the quality of teaching will certainly raise the achievement of the students But the most important step to be taken is to give pupils the proper facilities and atmosphere in their homes The study has very clearly indicated the magnitude of the influence of the pupils' environment Those coming from well-to-do families enjoy all the necessary facilities at home; then achievement compared with the other group is high. Naturally, pupils who have separate rooms for study and are free from household chores and worries can concentrate all their attention on studies. Moreover, in addition to the instruction they receive in the school, they are helped by their parents, who are usually well educated, or by private tutors who more often than not coach them for examinations unlike, or much more intensively than, teachers in schools. If a boy who walks three or four miles to school in the morning, starves during the day, walks back home and does odd jobs there before he can find some time for study, scores very low in examinations, neither his teacher nor the school is to be blamed The authorities probably may not be able to do much toward improving the conditions at home which depend mainly on the income of the parents.

Hence the following suggestions for action by the Department of Education:

1. Voluntary or professional social workers or welfare officers may be appointed to persuade and influence parents to create at least a proper atmosphere in the home and to take a genuine interest in their children and their studies.

2. A sufficient number of properly supervised boarding schools or halls of residence may be opened for pupils in whose case healthy home conditions are totally lacking. This may help greatly in eliminating many of the problems confronting the poor pupil at home. In many schools, which had been producing poor results for the past few years, a good proportion of the pupils came from poor homes. Given proper facilities there is no reason why these pupils should not do so well as the others.

3. The study has revealed how greatly private tuition at home has contributed in raising the achievement of the pupils. This points to the need for educational guidance in the school itself, particularly for pupils coming from poor or backward homes. Such guidance is all the more necessary as we find that in some schools at least many of these pupils have a very low level of aspiration and aim only at getting "failed" certificates. It is therefore strongly recommended

that a counsellor, trained in educational and vocational guidance, be appointed in every school Under this officer's supervision, tutorials may have to be arranged in every school outside of class hours, when guided study, diagnostic and remedial work and talks to motivate pupils for purposive work with a view to higher studies or careers, can be undertaken. These are suggested as the minimum programme which has to be implemented immediately if the huge wastage in secondary education is to be prevented and standards of achievement raised.

N P. Pillai is Professor and Head of the Department of Education and Dean of the Faculty of Education, University of Kerala, Trivandrum.

A Psychological Analysis of Some Factors Associated with Success and Failure in University Education— A Summary of the Findings[1]

Durganand Sinha

The rate of failure in university examinations in India is high. Figures[2] indicate that in the academic session 1958-59, for instance, roughly one in every two boys failed, among the girls failures amounted to almost 43 per cent. The figures collected in the institution where this study was conducted also indicate a high percentage of failure and under-achievement, and a very low percentage of candidates passing in the first division. These figures suggest the urgent need for analysing factors which are associated with success and failure in higher education

Some studies conducted in the country (for example, Kamat and Deshmukh, 1963) have demonstrated the relationship of age, sex, rural background, economic status and other background factors with wastage and stagnation in education. Studies in the West have brought out the importance of intelligence and aptitude, but they have also consistently emphasized the role of non-intellectual and dynamic factors in the student's performance. As Stern, Stein and Bloom (1956) have remarked:

> Once the question of minimal intellectual competence has been resolved, critical importance would then be attached to such matters as the manner in which a student could get along with his classmates, the extent to which he is accepted or rejected and the significance which he attaches to such responses from others, the character of his relationship with his teachers, and the extent to which he might be free from sources of anxiety and concern which might interfere with his capacity to absorb and integrate the academic experiences being offered to him.

Garrett (1949) also comments that "although admirable progress has been made in discovering and attempting to measure the factors which contribute to scholastic success in college, all writers agree that there remains a unique unmeasurable factor, or perhaps many factors, lost in the unpredictable intricacies of the human personality" The present study was concerned with factors like intelligence, anxiety, adjustment and other intellectual and non-intellectual factors associated with a student's performance at the university level. It was expected that a systematic analysis of such factors would serve as a useful guide to ameliorative measures and thereby help in reducing the amount of wastage of manpower and material resources in the universities. A detailed summary of the main findings of the study is presented here.

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[1] This paper is based on a study conducted with a grant from the National Council of Educational Research and Training, New Delhi

[2] See *Education in India, 1958-59*, Vol. II., Ministry of Education, Government of India.

METHOD AND PROCEDURE

A sample of 185 high achievers and 190 low achievers was selected for the present study Performance at the university examination was taken as the main criterion for the selection of subjects Originally it was planned to include among high achievers only students who had obtained a first class. However, the number of students in this category was so small that the criterion had to be relaxed and students who had obtained over 55 per cent marks were also included in the group of high achievers. Similarly, in the case of low achievers, though there were a large number of failures, it was not possible to find or locate them for the tests. In order to get a sufficient number of subjects in the group of low achievers, besides the cases of failure in the last examination, those obtaining a third division or just a borderline second division were included

These students were tested either individually or in small groups of three to four After filling in the Personal Data and Study Habit forms, Dr. S.M. Mohsin's Bihar Test of General Intelligence was administered This was followed by Sinha's Anxiety Scale (1961, 1962) and the "Vyaktitva Prashnavali (MA-62)", a general adjustment inventory developed by Dr. M.S L Saxena on the lines of Bell. Apart from the score on general adjustment, the latter provided a measure of adjustment in five areas home, health, social, emotional, and school.

For a more intensive analysis, a smaller number of high and low achievers were selected randomly from the larger sample. Eighty students were picked to constitute equal groups of high and low achievers. However, due to certain unavoidable exigencies, many of them could not complete all the tests, and the sample perforce got reduced to 27 high and 17 low achievers. They were interviewed intensively and put through a number of tests in the laboratory calculated to highlight certain motivational variables. These included game-type tests of persistence and level of aspiration, and Aronson's Graphic Expression test for measuring achievement motivation Further, a self-concept inventory was given to ascertain the nature of self-perception and discrepancy in self-image in high and low achievers. Differentials between the two groups of students were analysed on each of these counts Detailed case reports of some high and low achievers were prepared, which helped to present a total picture of such students and yielded certain interesting motivational and personality differences between them.

Lastly, the faculty perception of factors and qualities characterizing the typical high and low achievers was determined with the help of a graphic rating scale with 38 qualities, and the differences in the images of the two groups were analysed

SUMMARY OF RESULTS

Background factors and study habits

The investigation brought out certain interesting differences between the successful and unsuccessful students, and revealed the operation of some psychological variables behind their scholastic performance. As regards personal background, the high achievers, as compared with the lows, were a little younger, were mostly unmarried and lived generally with their parents or guardians Many of the low achievers were residing in hired rooms and a large proportion hailed from the rural areas. Religion, caste, parental occupation, size of household and the educational level of parents did not seem to have any association with the students' academic success or failure

As for educational background, no difference existed between the two groups with regard to pre-primary or primary education. More of the high achievers had received their secondary education in convents or in government or public schools, and were students of science. Their earlier academic performance had been superior and most of them had no incidence of failure, while a large number of low achievers required more than one attempt to pass their examinations. The highs had expected significantly higher marks in their examinations. As regards the discrepancy between the marks *expected* and marks *obtained* there was little difference between the groups at the high school level In higher examinations, the difference widened, large number of the highs reporting that their examination results were according to their expectations or better, while the lows felt that they had fared worse than they had anticipated. Moreover, the latter experienced greater dissatisfaction with their examination results, especially at higher levels. The number of low achievers who were disturbed and apprehensive of failure in examinations was significantly greater

Little difference was found between the groups with regard to the reported impact of praise, reward, reproof and punishment. While reward acted as a positive incentive for most of them, the effect of punishment was ambiguous and seemed to have generally a dampening influence. To that extent, its role as an incentive was detrimental

There was substantial agreement with regard to factors perceived as responsible for academic success and failure. Great weightage was put on hard work, intelligence and memory. Other factors considered as underlying failure were lack of self-confidence, dullness, the method of teaching, the system of examinations, and interest in social and political work

There was no difference as regards interests and hobbies reported by the respondents. Most of the subjects regarded them as beneficial or as having little impact on academic pursuits Membership of the National Cadet Corps, however, appeared to be associated with success and failure More low achievers had joined the organization, and its membership was looked upon by almost half the subjects in each group as being harmful or moderately harmful to studies

Suggestions or stimulation from the parents or residence with the family were perceived as having very little influence on scholastic activities. However, a few respondents, who viewed the family atmosphere as disturbing, complained mainly of household chores, lack of space, and noise. There was no difference between the highs and lows financially, except that many more of the former were receiving scholarships or state aid. However, both the groups tended to be concerned about pecuniary difficulties, and about half the number in each felt that the impact was detrimental to academic pursuits. There was no difference on the state of health and frequency of illness reported by the subjects.

A large proportion of the respondents had no vocational plans But among those who reported a desired profession, the high achievers seemed clearer and more definite, while the lows displayed considerable vagueness about the nature of the stated vocations

The high achievers were more systematic and regular in their studies and seemed to commence their preparation for the examination much earlier in the year. Except for this, there was not much difference in the study habits of the high and low achievers. Many in both the groups did not seem to possess the habit of regular study.

Intelligence, anxiety and adjustment

In their intellectual capacity, the more successful students were definitely superior with a mean I.Q. of 112.98 as against the 102 49 of the low achievers. This difference of over 10 points was statistically significant On analysing this data in terms of five categories of intelligence, viz, "very superior", "superior", "average", "inferior", "very inferior", it was observed that a majority of high achievers belonged to the first two categories. Very few of the low achievers came under these Again, over 55 per cent of the low achievers and only 39 per cent of the high achievers were classed as "average" in intelligence While a very negligible number of highs were in the inferior category, it is significant that over 60 per cent of the lows could be designated as inferior or very inferior in intelligence

Breaking down the intelligence scores faculty-wise, there was a negligible difference between the highs in the humanities and those in the science subjects, and between the lows in the two groups. However, differences between the highs and lows, both in the humanities and sciences, were statistically significant This study did not point to any superiority in the intelligence of students based simply on their subjects If anything, the highs in the Arts Faculty were slightly superior in intelligence to those in the Science Faculty

On the anxiety test, the distribution of the score of the high achievers was skewed on the lower side and that of the lows on the higher side. A comparison of the two means revealed the low achievers to be significantly more anxious. Analysed in terms of different levels of anxiety, there seemed no difference on the average level, about half the subjects in each group fell in this category On the other hand, a large proportion of low achievers made such high scores on the anxiety test, which, according to the norm, belonged to the level characterized by interference and disruption of performance in complex activities.

The anxiety scores were also analysed faculty-wise. In the case of high achievers, as with intelligence, no association between anxiety scores and the faculty was observed. But the difference between the highs and the lows within each faculty persisted The high achievers tended to score lower on the anxiety measure irrespective of the faculty. The picture was, however, radically different among the low achievers. The mean of the low-achieving students of the Arts and Commerce faculties was the highest, being over six points more than that of the science students. The difference was highly significant As a group, the unsuccessful students of the Arts and Commerce faculties were the most highly anxious. They were so anxious that the condition was likely to have a disruptive and interfering influence on their behaviour. Low academic achievement was probably an evidence of such inhibiting effect of anxiety.

On the adjustment inventory, the superiority of the high achievers was evident. Their mean of 244.99 as against the 236.26 of the lows was significantly better. Using the table of norms, the scores were classified into seven grades of adjustment, ranging from "excellent" to "poor adjustment". Very few of the subjects came under the two most superior grades of over-all adjustment or the lowest one of poor adjustment. A large majority in each group could be classified as good or satisfactory in adjustment. The differences, however, were significantly in favour of the high achievers. In the lower grades, a higher proportion comprised the low achievers. On all these comparisons, the high achievers showed over-all superiority in general adjustment.

Analysing scores faculty-wise, the differences between the two groups persisted. The results were similar to those already observed in the case of anxiety. While there was no difference among the highs of the humanities and the sciences, it was very marked in the case of the lows. The low achievers of the Arts and Commerce faculties were the poorest in over-all adjustment.

As regards the area of adjustment, no difference existed in respect of academic and social adjustment. With regard to home, health and emotional adjustment, the high achievers were significantly superior.

Motivational variables, persistence, level of aspiration and need achievement

Aronson's Graphic Expression test was utilized for measuring achievement motive. The score based on discreteness-fuzziness (D-F Index) was taken into account. On this test, there was no difference between the high and low achievers. As a measure of persistence, a game-type test was used. The task was such that failure was common, and continuing with the task in spite of failures was taken as a measure of persistence. A comparison of the scores obtained by the two groups showed the high achievers as possessing a much greater degree of persistence. The difference was statistically significant. Observations made during the testing also revealed the high achievers to be more enthusiastic, while the low achievers often displayed signs of apathy and despondency when they met with failure.

The general over-all level of aspiration was higher amongst the low achievers. They were also found to be more flexible. On the other hand, the high achievers tended to persist in their efforts even after encountering difficulty and failure In fact, analysis based on the number and direction of changes in the level of aspiration after encountering success and failure revealed some interesting differences. The majority of the subjects in both the groups either did not change their aspiration level or raised it after success Strangely enough, there was a tendency among many low achievers to lower their aspiration even after encountering success They seemed to avoid any risk of failure on the next attempt by decreasing the difficulty of the task even though they had done well on the previous trial. Further, a significantly higher proportion of the highs displayed no change, i e., they seemed to persist with their goal regardless of success or failure

A third in each group lowered their aspiration after encountering a failure, the tendency being stronger amongst the high achievers. Further, there was a greater proportion of highs among those who persisted with their goal even in the face of failure. It is to be noted that more than 17 per cent of the low achievers tended to raise their level even after failure This tendency was negligible among the high achievers The difference between the two groups was statistically significant.

The above analysis has generally indicated greater persistence and reality-orientation on the part of high achievers, and a comparative lack of the same among the low achievers, in the face of failure. The latter often reacted to failures by increasing the difficulty of the task and thereby entailed the risk of further failures. The high achievers, on the other hand, tended to adjust their goal more realistically or persisted in their attempts without changing the level of difficulty

Self-concept in high and low achievers

As regards their self-concept, the low achievers tended to perceive themselves in a more favourable light. They felt that other persons, both friendly and hostile, underestimated them on good qualities and ascribed more of unfavourable qualities to them. The social conflict index was present in almost all subjects. Its magnitude, however, was much greater among the low achievers. To this extent, they displayed greater susceptibility to maladjustment.

Faculty perception of qualities characterizing high and low achievers

A list of 38 qualities grouped under five headings, "cognitive-intellectual", "dynamic-personality", "social relations", "interest dimensions" and "environmental variable" was prepared. Each quality was defined and the teachers were required to indicate the different degrees in which these qualities were related to high or low academic achievement. They were jumbled together and each one of them was rated separately in relation to high and low achievement.

Analysis of the result showed that in the eyes of the faculty, high achievers were much superior on cognitive-intellectual qualities, and showed greater industry, perseverance and motivation. They did not seem to differ very markedly on social or environmental variables. None of the qualities from the interest or environment categories was seen as being possessed greatly by the high achievers. On the other hand, the qualities which were viewed as typically characterizing the low achievers mostly belonged to the interest group. Active interest in politics was perceived as the most detrimental influence on academic pursuits. The faculty also did not view interest in games, sports and co-curricular activities as being very conducive to studies. The factors which were accorded the highest premium by the faculty were related directly to the academic sphere or were motivational in character. For the teachers, the image of a typical high achiever was distinct from that of his less successful counterpart.

Salient features of case reports of some high and low achievers

Besides being given the tests mentioned earlier, the high and low achievers selected for detailed study were interviewed intensively. A detailed case report of each based on all the data gathered was prepared. As an individual, every high and low achiever possessed a unique personality organization. Yet certain broad and salient features appeared with some degree of frequency. In fact the high and low achievers had distinct profiles, showing certain marked differences in their cognitive capacities, motivation, and orientation to the future. A summary of these features is given below.

Most high achievers came from educated urban families and recalled a happy childhood. In spite of initial aversion to studies in some cases, there was an attitude of general satisfaction with the school, good relationships, and a fairly consistent record of academic attainment. Illness or disease did not figure with any prominence in their lives.

The attitude to parents was generally positive though in a few cases they were conceptualized as stern and domineering. The mother was more frequently perceived as loving, devoted and kind. The parental trust, confidence and high hopes reposed in the child acted as a strong motivating influence. A strong urge to excel the siblings and a desire for status through achievement were often noticed.

Generally, the high achiever possessed "superior" intelligence and displayed greater reliance on his own thinking, with marked interest in the theoretical and the abstract, and in literature and reading in general. He placed a premium on novelty in expression, and often valued research as a career.

The high achiever generally possessed satisfactory over-all adjustment and good home, health and emotional adjustment. In his social relationships, he was quite often withdrawn and liked only a few close friends. He usually displayed a normal range of anxiety and his major worries related to the general area of studies. He was able to "compartmentalize" his worries and focus attention on the problems before him concerning success in his studies. He quite often displayed social anxieties. His usual way of coping with them was to withdraw and cut himself off from such anxiety-provoking experiences. Anxiety seemed to act for him more as an instigator to better performance rather than as an inhibiting or interfering influence. He reflected a high level of motivation, greater persistence, and high ambitions and aspirations for a career. Desire for status and recognition was common and was often sought to be gained through academic pursuits. He frequently had a strong sense of duty and responsibility, with a strong future orientation.

In his self-image, he tended to underestimate his traits and felt that persons who were well disposed generally over-estimated his qualities. However, his self-image tended to coincide more with what others perceived him to be.

In study, he was usually systematic and regular, though quite often he showed no preference for a regular study habit. He possessed an ambivalent attitude towards the university, and was often critical of the administration and examinations, though quite positively disposed towards teaching methods and laboratory facilities; he emphasized the need for new ideas and a fresh spirit of growth.

The low achiever often came from rural areas and more poorly educated parents. A happy uneventful childhood was recalled along with parental pressure for early schooling. Childhood illness was sometimes recorded.

A distant and ambivalent relationship with the father was noticed, with the attitude of "fear" towards him. Greater closeness was displayed with the mother, who was perceived as loving and protective. There was minimal conflict and harmonious adjustment with siblings.

The low achiever generally possessed "average" intelligence and was conventional and lacked originality in thinking and expression. Interest in the abstract often took the form of fantasy. In fact, his fantasy-orientation was also reflected in his career aspiration and choice of models.

He was inferior to the high achiever in general adjustment and not infrequently encountered difficulties in home, health and emotional adjustment. Family trouble and tension due to pressure of responsibility were his persistent sources of worry. His anxiety level was higher and he experienced it in many areas. It produced in him a sense of inadequacy and insecurity, and was disturbing to his functioning. Worry concerning the examination and anxiety about his job prospect often drove him to escape in fantasy.

A markedly dependent behaviour was reflected in his attempt to face the problem before him. He had accentuated dependency needs which extended to his social environment. He was more conscious of his anxiety but was frequently unable to resolve the tension. Ego-defensive reactions to anxiety were more frequently observed; the low achiever coped with it by avoidance and repression. Anxiety tended to have an adverse influence on his functioning.

He generally displayed lower motivation and lacked in persistence and desire for recognition. He also displayed the absence of a strong need for achievement in regard to his current activity. Passive behaviour and helplessness were quite often utilized for gaining others' acceptance.

His career aspiration was ill defined and did not provide a strong urge for studies. Quite often his ambitions and aspirations were unrealistic and fantasy-like. He did not exhibit a realistic and strong orientation to the future.

In his self-perception, he had a good estimate of himself, but felt that others tended to undervalue his qualities. There existed a considerable discrepancy between his self-image and the image as perceived by others.

He generally spent his leisure in aimless activities like roaming about and gossiping. Quite often however he showed an active interest in games and other co-curricular activities.

He was not regular in his study habits. He was conscious of the great traditions of his Alma Mater, but frequently criticized the university authorities, the teachers, and the examination system.

DISCUSSION

Many of the findings of the present study conform to those obtained by other investigators. Misra (1962) found the low achievers to be significantly high on anxiety, while Jenson (1958) observed them as encountering more adjustment problems. One of the most notable features of our results is the clear-cut distinction between the high and low achievers on the anxiety test and the general adjustment inventory. In fact, anxiety and adjustment were the most discriminating indices. Not only were the low achievers significantly high on anxiety, but they were generally more maladjusted. On the self-concept inventory, too, the low achievers displayed greater social conflict, and thereby showed more susceptibility to maladjustment. The results point to the difficulty they faced in their general adjustment, and their experience of alienation from the social world. Low achievers in this sense might be called "neurotically hampered" students. It can be safely asserted that high anxiety and difficulties in adjustment, whatever their origin, were proving to be impediments for these students in their academic pursuits. The question whether poorer adjustment and high anxiety were causative factors in low achievement or whether they were themselves induced by persistent failure and low achievement cannot be answered conclusively though anxiety and neuroticism are often found to have an inhibiting influence on performance in complex situations, and the former also possesses a negative, though fairly low, correlation with academic achievement (Sinha, 1961). The importance of these factors in academic performance has been emphasized by different investigators. In a study (Misra, 1962) where no differential existed on the intelligence scores of high and low achievers in an engineering institution, the factors that differentiated them were their scores on tests of anxiety and general neuroticism.

In this study, as the factor of intelligence and other variables had not been partialled out or controlled, the exact amount of adverse influence which anxiety and poorer adjustment had could not be ascertained; however, their close relationship with low achievement was obvious.

The study revealed the intellectual level of many low achievers to be poor. In fact, if the test results are to be relied upon, the intelligence scores of many low achievers were so inferior that frustration and low achievement at the university level were inevitable. This certainly spells out a strong case for a better and more rigorous procedure of selection for admission to the university. Granted that the opportunity for higher education should be available to all, but with our very limited resources it is essential that the intellectually inferior be diverted to other channels and only those admitted to the universities who possess at least the requisite intellectual capacity and a reasonable chance of academic achievement. Taking in the intellectually inferior means wastage, and frustration for many. It also means overcrowding the universities with persons who should not be there and who turn their energies to political and other agitation simply because academic pursuits are beyond them.

The study did not reveal any apparent difference on the motivational index as assessed by the need achievement tests. Not all investigators have found high need achievement to go with successful academic performance. Moreover, the tests used may not have proved adequately sensitive in tapping the achievement need. This is probable because on some other indices of motivation, viz., persistence and level of aspiration, there seemed a distinct difference between the high and low achievers. The findings of this study confirm Eysenck's (1963) observation : "It has been found that the successful student is persistent, emotionally stable, and has level of aspiration not far too removed from reality; the unsuccessful student of similar intelligence lacks persistence, is unstable, and his levels of aspiration are unreasonably high or low."

This study has emphasized, besides intelligence, the importance of certain personality factors, especially anxiety adjustment and some motivational variables. Many of these factors can be controlled, and a proper scheme of admissions and counselling can mitigate some which hamper the low achievers, so that they can achieve a reasonable degree of success, thereby reducing wastage and frustration.

On the other hand, while developing a scientific programme of student selection, factors which have been found to be associated with the more successful students should be taken into consideration.

The study has revealed the importance of many background factors that aid and accelerate or retard academic performance. Like Kamat and Deshmukh (1963), the association between a rural background and low achievement was observed. It would, however, be incorrect to ascribe intellectual inferiority to a rural upbringing. No evidence whatsoever exists to support such a hypothesis. What seems more likely is that with the vast expansion in higher education, students from remote villages have flocked to cities and due to their background and training are finding basic difficulties in adjusting to the alien surroundings of urban life. Low academic achievement and a poor score on the adjustment inventory are but an indication of such difficulties. The situation calls for careful orientation programmes for the incoming students and well planned and vigorous student personnel services.

Lord Robbins (1963) has emphasized the role of environmental advantages and disadvantages in the academic performance of students. He has, in fact, hinted at the close association between the parents' level of occupation and the educational achievement of the student. In the present study, however, only negligible association between parental occupation and academic achievement was found.

The study revealed that neither the high nor the low achievers attached much importance to a proper study habit. What stands out is the fact that high achievers tended to begin their study earlier in the year while low achievers started systematic work when the examination was very close. It is our defective system of education and examinations which permits the postponement of study to just before the examination. In many cases poor performance can be ascribed to this postponement. It is significant that roaming and gossiping were mentioned as one of the most frequent ways of spending leisure. Obviously the curricular requirements were either not exacting enough or they failed to excite the students' interest. Moreover, our existing system of education is such that either there is no pressure of work in the form of class assignments, etc., or, as things stand, these can easily be avoided by the student, leaving him sufficient scope for such aimless and futile pursuits. If there were periodic class tests the results of which would count in the over-all academic grading of the students, every student would work regularly right from the beginning of the academic session and much of failure and under-achievement would be avoided. The existing system of one annual examination is certainly responsible for the wrong study techniques followed by many students and their aimlessness and lethargy for the greater part of the year.

The faculty's perception of factors associated with successful and unsuccessful student performance has emphasized the importance of intellectual and motivational qualities. Test results have also stressed the same set of factors. Motivation provides the necessary direction of effort and tells how much the individual is capable of exerting. The inter-relationship between motivation and academic attainment is not simple. In the present study, on many scores, the low achievers seemed to be more highly motivated. It is obvious that what is important is not just high motivation or wanting more. What is required is better channelization of one's dynamic energies in directions which are chosen realistically, and persistence in one's efforts in attaining goals. To be successful in academic pursuits, besides adequate intellectual competence, high motivation, persistence, greater reality-orientation and better adjustment are required. It is obvious that in any programme of student selection, besides performance in earlier examinations, intelligence, anxiety, general adjustment, motivation and certain background factors have to be taken into account. Each one by itself may not be a very reliable indicator of future academic performance, but taken together, they are likely to yield a better prediction of success or failure.

The existing systems of admission to university courses have not been effective in weeding out those who are intellectually and emotionally unsuited, and motivationally inadequate, for higher education. A sound programme of student selection and personnel services is therefore necessary.

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Durganand Sinha is Head of the Department of Psychology, University of Allahabad.

A Survey of Research in the Area of Creativity and Implications for School Practices

Baqer Mehdi

The recent interest in creativity as a field of research, especially in the United States, is due to a changed outlook on the part of educators as regards the desired outcomes of education and a feeling based on observation and empirical research that people who make creative contributions to society are not necessarily those who possess high intelligence. Educators have further felt that, if the fullest use of the nation's potential has to be made, people with abilities other than "intelligence" (and by this they mean especially those with creative thinking abilities) should be identified early, and their talents developed. It is assumed that under the present conditions of school organization the development of creativity is impeded rather than fostered.

The last decade has seen a great spurt in the effort to study more scientifically the nature of creativity, its measurement, and its possible development. This effort by research workers has resulted in a number of well planned and suitably designed studies which light up many aspects of creativity. The major contributions in this field are due to Guilford and his associates at the University of California, Getzels and Jackson at Chicago, Torrance at Minnesota, Taylor at Utah, and others who have followed the pioneer efforts of these eminent researchers, still in the field.

More than 500 studies are now on record, quite a number of the more significant ones having been conducted and completed during the last fifteen years or so. Attempts to summarize these researches have been made on various occasions and in different forms. In the periodical issues of the *Review of Educational Research* (December, 1959; December, 1961; February, 1962; February, 1963) special sections were devoted to reporting researches on different aspects of creativity. Of necessity however only limited space could be assigned. The *Encyclopaedia of Educational Research* (1960) also carried a section on creativity. In various other journals, attempts have been made to cover specific aspects of the subject. Thus Taylor reported research findings on creative characteristics in *Studies in Art Education* (Fall 1961) and Parnes on "*Education and Creativity*" in *Teachers College Record* (January 1963), and so on.[1]

The present reviewer seeks to present an all-round picture of the present status of research on creativity. The emphasis is on studies which have proved to be of significant value in improving our understanding of the creative potential, its measurement, and its development. To facilitate discussion the area has been demarcated into sections. Section 1 takes in researches which deal with the nature of creativity and its structure and process, the nature and characteristics of the creative person, and the relationship of creativity with intelligence and school achievement. Section 2 deals with the measurement of creative thinking abilities. Section 3 is concerned with the methods of developing creativity among children. Section 4, the last, is given exclusively to a discussion of the implications of research findings for classroom practices.

1. The Nature of Creativity

The first major experimental attempt which showed that creativity is a function of the intellect was that of Guilford In his monumental work on the structure of the intellect, Guilford (1956) was able to demonstrate "divergent thinking" as one of the most important intellectual operations by which the "product" or end result in the thinking process is reached. The other general areas in mental operations which he discussed were cognition, memory, evaluation and convergent thinking. Guilford defines "divergent thinking" as a kind of mental operation in which we think in different directions, sometimes searching, sometimes seeking variety. Unlike "convergent production" where the information leads to one right answer or to a recognized best or conventional answer, divergent production leads to novel responses to situations. The unique feature of divergent production is that a variety of responses is produced. Guilford relates divergent thinking to certain well-known ability factors which seem to go with creative output. At least three such factors are recognized, namely, fluency, flexibility and originality, each of which shows itself in particular forms according to the contents (figural, symbolic, semantic, and behavioural) and products (units, classes, relations, systems, transformations, implications) with which it is concerned. Thus, with verbal contents and in terms of the psychological products involved, the basic traits most clearly related to creative thinking include three fluency factors, two flexibility factors, and an elaboration factor. The three fluency factors Guilford names as ideational fluency, associational fluency and expressional fluency. Among flexibility factors he includes "flexibility with regard to classes of information", the factor first recognized as "spontaneous flexibility", and "adaptive flexibility", first called "originality", which enables the individual to turn old interpretations of information into new ones. By "elaboration", Guilford means "building upon given information, to round out a structure, to make it more detailed or to extrapolate in new directions". Guilford (1963) maintains that similar sets of six divergent production factors may be obtained with figural and symbolic information contents, of which five with each of the two types of content have already been demonstrated. He points out that it is the relative variety and novelty of the products found in divergent production that link this category of abilities logically with creativity.

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[1] For further references, see E.W. Eisner. Research in creativity: Some findings and conceptions. *Childhood Education*, April 1963, 39: 371-375.

The structure of intellect model which Guilford first presented in his presidential address to the APA in 1950 has continued to be modified since then. In a recent monograph by Guilford and Merrifield these modifications have been summarized. Guilford had originally thought that the abilities involved in creative thinking were those which he had defined as divergent production and transformation. He now holds that the divergent production abilities are not the only ones which contribute to success in creative performance (Guilford, 1962). Instead, in each operation area there is supposed to be a set of transformation abilities which may contribute to creative potential. Thus he now includes also the redefinition abilities, which are in the convergent production category of his structure of intellect, and a factor, interpreted as sensitivity to problems, which falls in the evaluation category and is recognized as an ability to evaluate implications.

Not satisfied with abilities and aptitudes alone as the bases for creative potential, Guilford in his later writings has tried to explain that there are "other traits of interest, needs, attitudes, and of temperament" which should be considered in thinking about creative potential which he maintains is essentially a combination of "dispositions that enable a person to use his information in novel ways".

Some important conclusions can be drawn from the researches of Guilford about the nature of creativity. First, that creativity is not a unitary trait but a complex of so many discrete abilities and personality qualities. The low intercorrelations found to exist among tests of divergent thinking abilities are a pointer in this direction. As Flescher (1963) puts it: "Apparently certain divergent thinking tests are also divergent from each other." In one of his recent articles Thorndike (1963) pointed to the danger of using creativity as a blanket term for all kinds of creative abilities. In his own words: "If as now seems to be the case the different sub-tests show quite low intercorrelations, and show even these in part because they all involve a little 'g', then we are ill advised to pool these sub-tests into a common tool with a common name, either in the treatment of our results or in thinking about the field." A second inference that can be drawn from Guilford's researches and is relevant to our understanding of the nature of creativity is that "successful creative performance, to the extent that it depends upon aptitudes, is not equally promising in all fields of endeavour. Potential for creative production in the arts is not the same thing as that in mathematics or that in writing, to say nothing of potential for creative handling of problems involving human relations". (Guilford, 1962).

Personality correlates of creativity

Attempts to understand the personality correlates of divergent thinking abilities have been made by Getzels and Jackson (1958), MacKinnon (1960) and Torrance (1962 b). Torrance has summarized his researches on personality variables of the highly creative person in his book, *Guiding Creative Talent.* In his personality studies of highly creative children, Torrance found that three personality characteristics stand out, differentiating the highly creative children from the less creative but equally intelligent children. First, the highly creative children have a reputation for having wild and silly ideas, especially the boys. Second, their work is characterized by the production of ideas "off the beaten track", "outside this world". Third, their work is characterized by "humor, playfulness, relative lack of rigidity, and relaxation".

MacKinnon (1960) describes a syndrome of creativity, including such aspects as: (a) the creative person's self-image as one who should be respected; (b) his sense of destiny about self; (c) his openness to experience; (d) his struggling towards reconciliation of opposites; (e) his seeking to tolerate increasing tension while striving for creative solutions to even more difficult problems; and (f) his high orientation to aesthetic and theoretical interests and values (Birch and Reynolds, 1963).

A good picture of the highly creative person as contrasted with the highly intelligent emerges out of a study by Getzels and Jackson (1958). In their bid to discover significant variables differentiating the highly creative from the highly intelligent person, Getzels and Jackson examined the achievement motives, fantasy production, school performance, and teacher preference of two types of adolescents. They found that the creative group (defined as "high on divergent thinking" as opposed to MacKinnon's definition "high in creative output"—a very important distinction which Getzels and Jackson failed to recognize) rated aspects of personal

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aspiration, such as marks, I.Q., pep and energy, character and goal-directedness lower than the high I.Q. group. The creative group rated a wide range of interests, emotional stability and a sense of humour higher than the high I.Q. group. The high I.Q. group wanted to possess those qualities that would lead to success, whereas the creative child did not express ambitions in terms of that goal. Personal aspirations of the high I.Q. group were those which they thought teachers would approve; the creative children were unmindful of teacher approval and showed a slightly negative correlation. Differences between the two groups also appeared both in quality and quantity of occupational goals. The quantity of possibilities mentioned was significantly greater for the highly creatives. Also, the highly creative group mentioned a significantly greater proportion of unconventional occupations than the highly intelligent group.

Taylor (1962) has also given us a picture of the creative individual "as unconventional and as resisting the drives towards conformity and the conventional thinking often found in the schools". Barron (1958) in his studies of highly creative people found them "more original, less suggestible and more tolerant of structural disorderliness".

Reid, King and Wickwire (1959) investigated the differences in cognitive and other personality attributes between twenty-four creative and twenty-four non-creative seventh-graders as nominated by peer ratings. The creative children were more sociable, more warm-hearted, and less anxious. Students from upper class socio-economic backgrounds appeared more stable emotionally. Creative lower class boys were more confident and self-sufficient than non-creative lower class boys, but no differences were found among upper class boys. Creative lower class girls, however, were less confident and secure than non-creative lower class girls.[3]

It is well to remember at this point that research on personality variables of creative children has not yet reached the point where we can safely formulate generalizations. Most of the studies cited above are quite limited in their scope both with regard to the population with which they are concerned and the controls they employ. Also, the results have to be interpreted in the light of the techniques that have been employed in the identification of the creative group. The area of activity in which we discover creative talent may have much to do with the kind of personality qualities we discover. A creative writer might differ significantly in respect of personality characteristics from a creative scientist or a creative artist.

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[3] Anderson, K.E. (Ed.) *Research on the Academically Talented Student.* NEA Project on the Academically Talented Student, 1961.

Creativity and intelligence

An important aspect of research on creativity has been the study of its relationship with intelligence. For layman and teacher alike "intelligence" has served as a blanket term to cover all aspects of a child's intellectual abilities. Earlier researches on such aspects as inventiveness, imagination and originality, though pointing in the direction of a clear difference between intelligence and these other abilities, were of little more than theoretical interest. It was only in the fifties when creativity became a matter of concern for them that educators started looking seriously at this problem. In an elaborately planned study of giftedness, Getzels and Jackson (1958) tried for the first time to compare members of a highly intelligent group who were in the top 20 per cent on I.Q. scores but not in measures of creativity and those in a highly creative group who were in the top 20 per cent on measures of creativity but not on I.Q. scores. They found that a large percentage of creative youngsters may elude identification by teachers or by conventional I.Q. measures. Getzels and Jackson's study was replicated by Torrance (1960). He concluded that if we identified as gifted those scoring in the upper 20 per cent on an intelligence test we would eliminate about 70 per cent of those who would score in the upper 20 per cent on a measure of creativity.

These findings suggest that it may be useful to keep traditional I.Q. and creativity concepts separate. But recently Simpson and Martinson (1961) summarized some of the findings from the California studies to conclude that "the use of intelligence quotients as an identification criterion also locates individuals of great variety and virtuosity. They presented data which bring into question the view that use of intelligence tests in identification will produce a concentration of persons narrowly oriented toward conforming academic excellence". (Birch and Reynolds, 1963). When data from Getzels and Jackson's study are more carefully analysed it does become clear that the relationship between creativity and intelligence is not entirely linear; rather a curvilinear relationship seems to exist between the two. In this connection, John Anderson's (1960) concept of ability gradient should be useful. According to this concept, ability level can be thought of in terms of threshold and we can ask questions as to the amount necessary to carry on a task and then consider the factors that determine function beyond this threshold. There are cut-off points or levels above which the demonstration of ability in relation to environmental demands is determined by the presence of other factors.

Getzels and Jackson (1962) and also Taylor (1962) have indicated that some minimum level of intelligence is required for outstanding success of a creative nature. What this level is cannot be specified. But several estimates place the minimal level at 120, beyond which intelligence measures fail to discriminate between highly creative and less creative students. Guilford's (1962) work supports this finding. In general terms, however, it may be safe to conclude with Getzels and Jackson that intelligence and creativity are by no means synonymous.

Creativity and education

An interesting aspect of research on creativity has been the study of its relationship with achievement in school and later vocational success. The findings of Getzels and Jackson (1958) and later of Torrance (1960) that the creative thinking abilities are apparently as important as those measured by traditional measures of I.Q. in educational achievement have only tended to confuse the issue. Flescher (1963) has however tried to clarify it in a recent study in which the validity of implications concerning the comparative influence of unusual creative thinking and exceptional intelligence in the learning process has been thoroughly studied. In an elaborately designed study in which the two groups left out by the earlier researchers, one characterized by non-extraordinary intelligence and creativity and the other by high creativity and high intelligence, were also used. Flescher found, as he should have found, that while there existed a significant relationship between intelligence and scholastic performance, creativity was not related to academic success. As will be easily seen, to speak of high correlation between creativity and school achievement of the formalized kind is in itself a negation of what we know about the relationship between creativity and intelligence. That Getzels and Jackson and Torrance did find a substantial relationship can be easily explained by the fact that they were concerned with those pupils in the creativity groups, who possessed sufficiently high intelligence, considerably above 120 I.Q. Once the intelligence of high creatives fell below this level the mean achievement scores of the high creative groups fell significantly below those of the high I.Q. group. As pointed out by Flescher, when we talk of creative talent and divergent thinking abilities we must also think of divergent achievement indices. It is proposed that just as I.Q. is related to convergent achievement, an analogous relationship exists between C.Q. (creativity quotient)—again a dangerous concept—and divergent achievement.

Regarding the relationship between creativity and success in jobs, it has long been recognized that creativity is a distinguishing characteristic of outstanding individuals in almost every field. It appears to be important even in jobs which appear to be quite routine, such as selling in a departmental store (Wallace, 1961). This is understandable because in job situations it is the novelty and flexibility of response rather than response of a convergent type which often counts for success.

2. MEASUREMENT OF CREATIVE THINKING ABILITIES

Efforts to produce instruments for assessing the creative thinking abilities have in one form or another continued since Dearborn first attempted in 1898 to study the imaginative responses of Harvard students and faculty to a series of ink blots. A number of different tests were developed between 1898 and the efforts of Guilford in the fifties to develop instruments for the measurement of divergent thinking abilities. Besides ink blots and other projective devices, analogies have been used most frequently to obtain measures of creative thinking abilities of adults. Chassell in 1916 and Elizabeth Andrews in 1930 developed a number of different tests similar to those included today in divergent thinking abilities test batteries. Similar sporadic efforts continued to be made in the thirties and forties, until Guilford first undertook this task on a systematic and large-scale basis in his factor analytic studies of various thinking abilities including creativity. As in all factor studies, the mathematical factors that have been subsumed under divergent thinking abilities are those which seem most related to what is known of the nature of divergent thinking abilities. Thus we have tests which measure fluency (the ability to produce large numbers of ideas), flexibility (the ability to produce a variety of ideas or use a variety of approaches), originality (the ability to produce ideas that are off the beaten track), elaboration (the ability to fill in details), sensitivity to problems (the ability to evaluate implications), and redefinition (the ability to define or perceive in a way different from the usual, established or intended way).

There exist verbal as well as non-verbal tests to measure the different manifestations of these abilities. Tasks or materials that have been used in eliciting creative responses from young children include drawing tests, samples of scribbling, ink blots, imaginative play, picture tests, verbalizations while painting, and standardized problem situations. The kinds of tests for assessing the creative thinking abilities of high school students have been more restricted than those for elementary pupils. Most of the measures are group administered, use verbal stimuli and require only verbal written responses. Most widely used are Flanagan's Ingenuity Test and a selection from the battery developed by Guilford (Torrance, 1963).

Nothing much is known about the predictive validity of these tests. Nor do we know what combination of sub-tests will measure which type of creative talent. The low intercorrelations of tests included in the divergent thinking abilities test battery remind us that "we will be well advised to use with a great deal of tentativeness the term 'creativity' as applied to any or all of the tests, or 'creative' as applied to children selected on the basis of them". (Thorndike, 1963).

Attempts have also been made to use non-test ways for identifying creative behaviour. One study revealed that the non-test way of identifying creative talent most frequently named by teachers is the use of indicators of behaviour like curiosity, inquisitiveness, investigativeness, and penetrating questioning. "Other frequently listed non-test indicators include: originality in behavior (e.g., unusual solutions, unusual answers and unusual approaches to problem solving); independent, individualistic, courageous behavior; imagination (e.g., fantasy and story-telling); non-conforming behavior (not being bothered by pressures to conformity); unusual perceptiveness of relationships; an overflow of ideas; experimentalism; unusual flexibility in meeting emergencies; unwillingness to give up; constructiveness; day-dreaming and preoccupation with an idea or problem; and going beyond assigned tasks." (Torrance, 1963).

MacKinnon and his group (1961) at the University of California have shown that the most creative architects and scientists are identified by means of interest and temperament inventories. Guilford comments that the information these yield have concurrent validity; presumably they have predictive validity as well.

3. DEVELOPING CREATIVITY AMONG CHILDREN

A considerable amount of research has been done in recent years to determine ways and means of developing creativity among school children. On the question whether creativity can, in fact, be fostered through environmental manipulation, research workers are generally agreed that education can do a great deal in promoting creative performance, if perhaps not in producing the creative abilities themselves. Torrance (1962a) in his cross-cultural studies has shown that several cultures and subcultures impede the growth of creativity through subtle, consistent pressure for conformity.

In a recent article, Parnes (1963) has pointed out that no research yet reported is inconsistent with the view that creative productivity can be developed by deliberate procedures. The committee set up for the first time in 1959 to report on "The Educational Experience in the Development of Scientific Creative Talent" reported that at least six research projects had indicated that creative productivity can be developed by deliberate procedures (Taylor, 1959) Maltzman and his associates (1959) at the University of California concluded a group of research studies on originality training by asserting that the results supported the hypothesis that "originality is a learned form of behavior which does not differ in principle from other forms of operant behavior".

Parnes has given a good account of educational programmes at the University of Buffalo where courses in creative problem solving are offered with a great deal of success. In one of a series of studies, a battery of ten measures, which had been previously demonstrated by other investigators to distinguish creative from non-creative persons, was used and it was found that students who took the course registered substantial gains on tests measuring the factors of originality, sensitivity to problems, spontaneous flexibility and ideational fluency.

There is also evidence that when creative efficiency has been developed by education, the improvement endures (Parnes, 1960).

Methods for teaching creativity

One method which has been commonly applied in classroom situations to foster greater ideational fluency has been brainstorming, a technique publicized by Osborn (1957) in management and industry. An essential element in this method is to have a group focus on a particular problem and then invite the members to give as many ideas as they can think up for possible solutions of the problem. There is a kind of free wheeling with ideas and no criticism is allowed. Evaluation is made after all ideas have been presented. Suchman has developed methods of what he terms "inquiry training" for elementary school children. Synetics (a method of creative problem solving based on the idea that creative efficiency can be increased markedly if people understand the psychological processes by which they operate, and that in the creative process the emotional component is more important than the intellectual, the irrational more important than the rational), and bionics (a somewhat similar method which relies heavily upon analogies to biological and electronic phenomena as a source of generating new ideas) have been found of value.

There have been some interesting studies in recent years on the role of the teacher's behaviour in the classroom in developing creativity among students. Gallagher (1964) reports that there are numerous indications that only slight changes in style and approach can modify the child's output in terms of originality and uniqueness on tests. Some direct evidence on the teacher's role was presented by Gallagher and Archner (1963) who found that the number of questions requiring divergent thinking asked by the teacher in a social studies class of gifted children determined the proportion of divergent thinking expressed by the students. Spaulding (1963) found that students' feelings and performances were related to the affective or emotional atmosphere developed by the teacher, as measured by time-sampling observation of the teacher in the classroom, and that the teacher was an important figure in the development of both cognitive processes and personality characteristics in children.

4. IMPLICATIONS FOR CLASSROOM PRACTICES

The researches summarized in this review point to some important implications for school organization and teaching practices.

The personality characteristics of the creative person which make him look so different from the highly intelligent person and which often make him unacceptable to the teacher point to the urgent need for a better understanding of the creative child on the part of the teacher. Guilford has indicated that "outside the arts we have generally discouraged the development of divergent thinking abilities, unintentionally but effectively".

Failure to distinguish between convergent and divergent talent in our schools may have serious consequences for the future of our society. As pointed out by Getzels and Jackson (1962): "Both kinds of talent are sufficiently important to warrant attention in educational theory and practice, and it is unwise to think of divergent fantasy as simply rebellious rather than germinal, or an unconventional career choice as invariably unrealistic rather than courageous."

With better understanding of creative behaviour, teachers should be able to redefine many behaviours usually labelled as undesirable and to see in them an indication of abilities which give promise of highly desirable talents.

Findings relating to the measurement of creative thinking abilities suggest that teachers should try to become more efficient in the use of non-test ways of identifying creative talent. It will take some time for existing tests of creativity to come into common use.

More important from the teacher's point of view are the findings which have a direct bearing on classroom teaching. The indication from the weight of present evidence that children can be taught to use creative thinking abilities in acquiring even traditional school learning and that many things can be learned more effectively and economically in creative ways rather than from authority should open up exciting possibilities for modifying methods of instruction to bring them in line with the creative ways of learning. Torrance (1963) has enumerated a number of principles which the teacher can follow in making the creative ways of learning powerful ones for all children. One way, Torrance suggests, is to offer a curriculum with plenty of opportunities for creative behaviour. Assignments which call for original work, independent learning, self-initiated projects and experimentation are some of the ways of accomplishing this. Secondly, development of certain skills which are necessary to creative ways of learning is essential. Much will depend on how teachers develop a kind of creative relationship with children.

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Baqer Mehdi is Senior Research Officer in the Department of Psychological Foundations, National Council of Educational Research and Training, New Delhi.

A Comparison of Examination Marks with Assessment By Teachers

A. R. Kamat

The performance of students in our universities is currently assessed on the strength of the marks obtained by them in the examination held at the end of the year. Some of the examiners, although qualified and competent, are "external", that is, outsiders who have not taught the students they are asked to examine. This procedure is criticized (and rightly so) for the reason that it does not always reflect the actual abilities of a student, his understanding of the subject and the manner in which he has been working during the year, which his teacher is in a far better position to know and to assess. There is no reason why the teacher's assessment based on his during-the-year valuation should not replace the present system of examination at the year-end. The innovation may be started right away in subjects at the post-graduate level where the number of students is small and where teachers are closely associated with the work of the students, as for instance in the science subjects. To probe this question I conducted a modest investigation in which the teachers' assessment was compared with the examination performance of candidates who appeared for the Master's examination in statistics held recently in a university in Western India. Although the numbers involved were small they revealed some interesting features. An account is given in the following paragraphs with the hope that it will start discussion on this vital reform.

The board of examiners consisted of two external examiners, one internal examiner, who was closely familiar with the courses taught but who had not taught during that year, and two internal teacher examiners. I requested all the teachers (whether examiners or otherwise) in the department of the university a few weeks before the examination to give me their assessment of the students in the courses that they had taught, separately for each course. Since all the candidates were students in the department I had the teachers' assessment of all candidates in almost all the papers in which they were examined. This could then be set against the candidates' performance in the examination. (I am grateful to the teachers for their cooperation.)

The examination consisted of two parts. Each part had four papers in theory and some "practical" papers in which a candidate's ability to apply his knowledge of theory numerically is tested. In the present comparison "practical" papers have not been considered. The theory papers will be designated as follows: Part I: Papers I, II, III, IV; Part II: Papers V, VI, VII, VIII. Candidates who had failed earlier were not considered for this comparison to avoid the effect of previous impressions on the part of the teacher.

Teachers were asked to give their assessment in the form of grades with the following correspondence between grades and intervals of percentage scores:

Grade	*Interval of scores*	*Notional value for combining scores*
A	80 and above	85
B	65 to 79	72
C	55 to 64	60
D	45 to 54	50
E	35 to 44	40
F	Below 35	25

The intervals were more or less determined by the minimum percentage for a pass which is 35, and the minimum percentage for a first class, which is 65. A paper very often consisted of different parts for which courses were taught by different teachers. This necessitated combining grades given by two or more teachers to arrive at the combined grading of a student in that paper. For this purpose the notional values of scores given in the last column of the table above were used. The notional values given for A and F are arbitrary and are based on the experience of examining candidates who sit through the whole examination. In any case this will not much affect the comparison since very few candidates were given A or F by their teachers. The weights used for combining the grades in parts of a paper were the same as those given in the examination by the number of questions set in those parts in that paper. The combined scores were then reconverted into grades for the paper concerned. For a combined grade in the whole examination consisting of four papers the same procedure was adopted. Comparisons were then possible: (i) between the grades obtained from the teachers' assessment and the corresponding examination marks converted into grades; or (ii) between the notional scores and percentage examination marks. Both were attempted in the sequel.

In the examination in Part I only ten fresher candidates appeared for all the four papers while in Part II, 22 candidates took the whole examination. Their classification by teachers' assessment and examination performance are given in the following tables.

TABLE 1

Grades in teacher's assessment and examination in Part I

		Teacher's assessment						
		A	B	C	D	E	F	Total
Examination	A	...	...	...	...	...	...	...
	B	...	...	...	...	...	...	...
	C	...	...	1	...	...	...	1
	D	...	1	2	...	...	...	3
	E	...	...	2	1	...	...	3
	F	...	...	...	3	...	...	3
	TOTAL	...	1	5	4	...	...	10

(Correlation coefficient between scores is 0.7789)

TABLE 2

Grades in teacher's assessment and examination in Part II

		Teacher's assessment						
		A	B	C	D	E	F	Total
Examination	A	...	...	...	...	...	..	...
	B	1	1	...	...	...	...	2
	C	...	2	2	...	...	...	4
	D	...	1	3	3	...	...	7
	E	...	...	...	4	...	...	4
	F	...	...	2	3	...	...	5
	TOTAL	1	4	7	10	...	...	22

(Correlation coefficient between scores is 0.5860)

It was also thought useful to make the same comparison in individual papers. This was based on all the candidates who took a particular paper. (This number will differ from paper to paper.) The following tables present these comparisons for Papers I and II in Part I, Papers V and VI in Part II, all of which are compulsory papers, and two of the optional papers in Part II, which are called Papers VII and VIII for convenience.

TABLE 3

Grades in teacher's assessment and examination in Paper I, Part I

		Teacher's assessment						
		A	B	C	D	E	F	Total
Examination	A	...	...	...	...	...	...	...
	B	...	...	...	...	...	...	...
	C	...	...	...	...	...	...	...
	D	...	...	3	1	...	...	4
	E	1	...	1	...	...	...	2
	F	...	...	...	2	1	1	4
	TOTAL	1	...	4	3	1	1	10

(Correlation coefficient between scores is 0.6511)

TABLE 4

Grades in teacher's assessment and examination in Paper II, Part I

		Teacher's assessment						
		A	B	C	D	E	F	Total
Examination	A	...	...	...	...	...	...	...
	B	...	...	...	...	...	...	...
	C	...	2	...	...	...	...	2
	D	...	...	1	...	...	...	1
	E	...	2	1	...	...	...	3
	F	...	...	7	...	...	...	7
	TOTAL	...	4	9	...	...	..	13

(Correlation coefficient between scores is 0.6320)

TABLE 5

Grades in teacher's assessment and examination in Paper V, Part II

		Teacher's assessment						
		A	B	C	D	E	F	Total
Examination	A	...	...	...	...	...	...	...
	B	...	3	...	...	...	...	3
	C	...	2	1	1	...	...	4
	D	...	2	1	1	...	...	4
	E	...	...	1	4	...	...	5
	F	...	...	2	7	...	...	9
	TOTAL	...	7	5	13	...	...	25

(Correlation coefficient between scores is 0.6745)

TABLE 6

Grades in teacher's assessment and examination in Paper VI, Part II

		Teacher's assessment						
		A	B	C	D	E	F	Total
Examination	A	1	...	...	...	...	...	1
	B	...	2	...	...	...	...	2
	C	...	1	2	1	...	...	4
	D	...	3	3	1	...	...	7
	E	...	1	2	...	...	...	3
	F	...	1	3	4	...	...	8
	TOTAL	1	8	10	6	..	...	25

(Correlation coefficient between scores is 0.5305)

TABLE 7

Grades in teacher's assessment and examination in Paper VII, Part II

		Teacher's assessment						
		A	B	C	D	E	F	Total
Examination	A	1	...	...	...	...	...	1
	B	...	1	2	...	...	...	3
	C	...	1	1	2	...	...	4
	D	...	...	...	3	..	...	3
	E	...	...	...	2	...	...	2
	F	...	...	2	5	...	...	7
	TOTAL	1	2	5	12	...	...	20

(Correlation coefficient between scores is 0.5881)

TABLE 8

Grades in teacher's assessment and examination in Paper VIII, Part II

		Teacher's assessment						
		A	B	C	D	E	F	Total
Examination	A	...	...	...	...	...	...	...
	B	...	1	1	...	...	...	2
	C	...	1	1	1	...	...	3
	D	...	...	3	...	...	...	3
	E	...	...	...	...	..	...	...
	F	...	...	2	...	...	...	2
	TOTAL	...	2	7	1	...	...	10

(Correlation coefficient between scores is 0.2512)

I shall now comment on the tables. It will be inadvisable to draw firm conclusions from this data as the numbers involved are small. But this will perhaps be the case in all investigations of this type concerning post-graduate examinations in departments of science and it is therefore desirable to notice tendencies which are clearly shown by the tables. First, in these tables there are very few entries above the main diagonal, which means that the examination grade is very rarely higher than the grade given by the teacher. There are no such cases in the examination in Part I (Tables 1,3, 4). In the examination in Part II, they do not occur in the examination as a whole but only in the individual papers (Tables 5, 6, 7, 8). They are one each in Papers V and VI; four in Paper VII and two in Paper VIII. Out of these the two from Papers V and VI, two from Paper VII and one from Paper VIII are on the border of score intervals. (This is perhaps inevitable in a comparison involving marks and grades.) For the remaining three the examination scores are not greater than five per cent above the upper limit of the class interval corresponding to the grades. It is also to be noted that these clear cases are found in the optional papers. Taking into consideration the fact that there is a period of one-and-a-half to two months between the end of the term and the examination, during which candidates intensively work on their own, and also the traditional nature of the examination, such cases could be more frequent; it is remarkable that this did not happen.

Another notable feature is that the number of cases on the main diagonal are also very few, the bulk lying below the diagonal, indicating that the examination grades are invariably lower than those given by the teachers. From these may be excluded the cases of those candidates who, when they become convinced that they cannot score high, merely drag themselves through the examination (taking good care that they will fail) in the hope that they will do better next year. Such cases of "aberration" were: one in Table 1, one in Table 3 and two in Table 4; three in Tables 2, 5, 6 and 7; and two in Table 8. Even after excluding them the tendency mentioned above is still quite marked. Another aspect of this was observed in the fact that hardly any teacher gave a grade lower than D. Table 4 shows that out of nine students who were given C by the teacher nobody could get C in the examination and seven just failed, and Table 3 shows that one candidate getting A from his teacher was placed as low as E in the examination. The situation observed in Tables 5, 7 and 8, where a teacher himself examined his students, is not a great improvement. If one considers the cases occurring on the diagonals immediately above and below the main diagonal (that is, a difference of one grade above or below) as not unreasonable deviations, one still finds that (after excluding the "aberration" cases mentioned above) the downward drop is quite considerable except perhaps in Tables 5 and 7. This seems to be due to the tendency to "grade safely" when one is not able to judge precisely.

No comments are offered on the correlation coefficients between the notional scores based on teachers' assessment and the examination marks. The size of the groups is rather small for this purpose and the "aberration" cases mentioned above affect them considerably. They support, in general, the features noted above.

Investigations such as the above can never reach a clear-cut conclusion, one reason being that they unconsciously tend to take the year-end impersonal examination (which is sought to be replaced) as a standard for comparison. It is clear, however, from the figures given above that the teacher can more or less accurately gauge the upper limit of his students' knowledge of the subject even in the present conditions when admittedly there does not exist close personal contact between him and his students. If an internal valuation system is adopted the "aberration" cases will naturally disappear. Moreover, the teacher who is then made responsible for the valuation of his students' work is sure to develope a closer contact with it and to devise many more occasions for an appraisal of their work, thus eliminating the tendency of "safe grading".

A. R. Kamat is Head of the Department of Statistics and Joint Director, Gokhale Institute of Politics and Economics, Poona.

Factor Structure of the Marks of the Pre-Degree Examination (1962) of Poona University

A. R. Kamat
A. G. Deshmukh
R. K. Pandit

Whenever a sizable data of examination marks is available, it is often instructive to subject it to the technique of factor analysis and take a look at the factor pattern thrown up. We had with us complete data on the examination marks of 2,400 candidates selected by appropriate sampling methods from amongst those who had appeared for the Pre-Degree examination in Arts and Science of the University of Poona held in 1962. This had been collected for a previous study[1] which investigated the effects of the scheme of internal and external assessments which was introduced that year by the Poona University for the first time. The present analysis is based on this data.

For the Pre-Degree (P.D.) Arts examination a candidate has to offer English and six other subjects which he can choose under specified groups and under specified restrictions. For this examination, samples were selected from the candidates who had offered the following subject-combinations (which accounted for more than seventy-five per cent of the total number of candidates): (1) English, (2) Marathi, (3) Geography, (4) Economics, (5) Civics, (6) Sanskrit or Hindi, and (7) Ancient Indian Culture (AIC) or Modern World History (MW). On the basis of previous experience it was considered desirable to divide the candidates according to their centres of examination, into three groups: (1) Poona Centres group, and outside Poona; (2) Old Centres group; and (3) New Centres group. A random sample of 400 students was selected from each of these groups from the "regular" candidates, that is, those candidates who appeared for this examination for the first time in 1962.

For the P.D. Examination in Science a candidate has to offer the following five compulsory subjects: (1) English, (2) Physics, (3) Chemistry, (4) Biology,

(Continued on page 76)

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[1] The Internal and External Assessments, *Artha Vijnana*, 1963, Vol. 5, Nos. 3 and 4.

Table 1

Correlation matrix of examination marks in different subjects for PRE-DEGREE ARTS Examination, 1962

	English	*Marathi*	*Geography*	*Economics*	*Civics*	*Sanskrit or Hindi*	*A.I.C or M.W.*
Poona Centre							
1 English	1.0000	0.4412	0.3787	0.4409	0.3602	0.4796	0.4024
2 Marathi		1.0000	0.5998	0.5074	0.5686	0.6340	0.4914
3 Geography			1.0000	0.5634	0.4840	0.5787	0.3992
4 Economics				1.0000	0.4774	0.5444	0.4569
5 Civics					1.0000	0.4137	0.5143
6 Sanskrit or Hindi						1.0000	0.3725
7 A.I.C or M.W.							1.0000
Old Centres							
1 English	1.0000	0.3937	0.3354	0.4080	0.3712	0.3273	0.3604
2 Marathi		1.0000	0.4992	0.4623	0.5247	0.5791	0.5291
3 Geography			1.0000	0.5186	0.4250	0.5227	0.5040
4 Economics				1.0000	0.5174	0.5048	0.5718
5 Civics					1.0000	0.5228	0.5632
6 Sanskrit or Hindi						1.0000	0.5109
7 A.I.C. or M.W.							1.0000
New Centres							
1 English	1.0000	0.4810	0.4554	0.3745	0.4518	0.4417	0.4463
2 Marathi		1.0000	0.4167	0.5095	0.5690	0.5168	0.5003
3 Geography			1.0000	0.4383	0.4894	0.5011	0.4023
4 Economics				1.0000	0.6339	0.4323	0.5354
5 Civics					1.0000	0.4835	0.5425
6 Sanskrit or Hindi						1.0000	0.4536
7 A.I.C. or M.W.							1.0000
Pooled Sample							
1 English	1.0000	0.4563	0.3804	0.3898	0.4237	0.4281	0.4016
2 Marathi		1.0000	0.4747	0.4463	0.5991	0.5872	0.4923
3 Geography			1.0000	0.4922	0.4020	0.5221	0.4315
4 Economics				1.0000	0.4711	0.4759	0.5076
5 Civics					1.0000	0.4763	0.5261
6 Sanskrit or Hindi						1.0000	0.4414
7 A.I.C. or M.W.							1.0000

Table 1 (*Contd.*)

Correlation matrix of examination marks in different subjects for PRE-DEGREE SCIENCE Examination, 1962

		English	*Physics*	*Chemistry*	*Biology*	*Mathematics*	*M.I.L.*	*Arts subject*
	Poona Centre							
1	English	1.0000	0.5331	0.5862	0.6034	0.5630	0.4453	0.4813
2	Physics		1.0000	0.8291	0.7228	0.8217	0.4715	0.4630
3	Chemistry			1.0000	0.6531	0.8039	0.5413	0.5084
4	Biology				1.0000	0.6115	0.4648	0.3994
5	Mathematics					1.0000	0.4427	0.4784
6	M. I. Language						1.0000	0.5512
7	Arts subject							1.0000
	Old Centres							
1	English	1.0000	0.5249	0.5044	0.5613	0.4841	0.4018	0.4787
2	Physics		1.0000	0.7659	0.6156	0.7665	0.4819	0.4938
3	Chemistry			1.0000	0.6582	0.6952	0.3962	0.5051
4	Biology				1.0000	0.5831	0.4497	0.5420
5	Mathematics					1.0000	0.3845	0.4603
6	M. I. Language						1.0000	0.5632
7	Arts subject							1.0000
	New Centres							
1	English	1.0000	0.6103	0.6166	0.6508	0.5294	0.6092	0.5471
2	Physics		1.0000	0.7355	0.7449	0.7348	0.5232	0.5038
3	Chemistry			1.0000	0.6603	0.7335	0.4842	0.5863
4	Biology				1.0000	0.5970	0.5411	0.5181
5	Mathematics					1.0000	0.4939	0.4748
6	M. I. Language						1.0000	0.6068
7	Arts subject							1.0000
	Pooled Sample							
1	English	1.0000	0.5432	0.5515	0.5910	0.5147	0.4746	0.5087
2	Physics		1.0000	0.7792	0.6896	0.7764	0.4902	0.4756
3	Chemistry			1.0000	0.6615	0.7498	0.4802	0.5221
4	Biology				1.0000	0.6024	0.4775	0.4918
5	Mathematics					1.0000	0.4411	0.4696
6	M. I. Language						1.0000	0.5512
7	Arts subject							1.0000

TABLE

FACTOR LOADINGS FOR THE

Subject	Factor	Poona Centre			Old Centres	
		F_1	F_2	F_3	F_1	F_2
PRE-DEGREE						
1 English		0.6563	—0.1551	0.6914	0.5871	0.7921
2 Marathi		0.8224	—0.0398	—0.1670	0.7729	—0.0745
3 Geography		0.7750	—0.2182	—0.3198	0.7343	—0.1722
4 Economics		0.7672	—0.0948	—0.0264	0.7709	0.0352
5 Civics		0.7298	0.4248	—0.1946	0.7605	—0.0480
6 Sanskrit or Hindi		0.7779	—0.4068	—0.0335	0.7715	—0.2428
7 A.I.C. or M.W.		0.6861	0.5578	0.1744	0.7861	—0.1072
λ		3.9050	0.7394	0.6783	3.8671	0.7366
Percent of total variation explained		55.8	10.6	9.7	55.2	10.5
PRE-DEGREE						
1 English		0.7499	0.0646	0.3543	0.7181	0.0869
2 Physics		0.8856	—0.2920	—0.1125	0.8655	—0.2551
3 Chemistry		0.8965	-0.1618	—0.1063	0.8442	—0.2954
4 Biology		0.8059	—0.2048	0.1506	0.8139	—0.0298
5 Mathematics		0.8625	—0.2573	-0.1176	0.8150	—0.3459
6 M. I. Language		0.6826	0.5278	—0.0821	0.6529	0.5930
7 Arts subject		0.6746	0.5661	—0.0513	0.7298	0.4477
λ		4.4647	0.8227	0.5515	4.2632	0.8325
Percent of total variation explained		63.8	11.7	7.9	60.9	11.9

2

FIRST THREE FACTORS, F_1, F_2, F_3

		New Centres			Pooled sample	
F_3	F_1	F_2	F_3	F_1	F_2	F_3
ARTS						
0.0817	0.6915	—0.4120	—0.4623	0.6618	—0.4099	—0.4365
—0.0151	0.7702	0.0584	—0.2306	0.7933	—0.1878	—0.0584
0.5479	0.7034	—0.3831	0.4629	0.7140	0.5008	—0.2299
0.0350	0.7580	0.4311	0.1800	0.7312	0.3133	0.2337
—0.4848	0.8085	0.2587	0.0981	0.7595	—0.3097	0.2779
0.0666	0.7320	—0.2920	0.1632	0.7657	0.1422	—0.2679
—0.1886	0.7460	0 2509	—0.2192	0.7360	—0.0545	0.4382
0.5834	3.8868	0.7209	0.5979	3.8164	0.6713	0.6425
8.3	55.5	10.3	8.5	54.5	9.6	9.2
SCIENCE						
0.6254	0.8051	0.1878	0.3628	0.7480	0.1777	0.5764
—0.1873	0.8650	—0.2957	0.0627	0.8702	—0.2981	—0.1140
- 0.0960	0.8570	—0.2376	—0.2022	0.8672	—0.2452	—0.1098
0.1793	0.8374	—0.1152	0.3009	0.8194	—0.0992	0.2172
—0.1736	0.8109	—0.3473	—0.2213	0.8329	—0.3284	—0.1709
—0.2918	0.7418	0.4933	0.0771	0.6883	0 5121	—0.2902
—0.0272	0.7385	0.4338	—0.4099	0.7096	0.4811	—0.1024
0.5836	4.5853	0.7446	0.4899	4.4113	0.7919	0.5284
8.3	65.5	10.6	7.0	63.0	11.3	7.5

and (5) Mathematics. He has also to offer two more optional subjects which may be called Subject (6) and Subject (7). The following combination, (6) Marathi or Hindi or Additional English as Modern Indian Language (MIL), and (7) Civics or Sanskrit or German or Hindi, if it is not offered under (6) as an Additional Arts subject, covered more than ninety per cent of the candidates appearing for the examination. Here also students were classified under three groups of centres and a sample of 400 was selected from each group of centres from among the regular candidates, as for the Arts examination.[2]

For the purpose of the present analysis we considered only the examination marks and ignored the internal assessment scores as the latter were likely to vary from college to college. Again, in the three science subjects, physics, chemistry and biology, the marks in the theory paper alone were taken, ignoring the marks in the practical examination. Analysis was first done separately for each of the three groups or centres and then for the pooled sample of 1,200 for the entire university, for Arts and for Science.

The method of Principal Components was used to locate the underlying pattern of factors. For this purpose correlation matrices were obtained for each set and communalities were taken as unity in their analysis. As is customary in such cases, the analysis was continued up to three factors. Correlation matrices for each sample of 400 as well as for the pooled sample of 1,200 for Arts and for Science are given in Table 1 (pages 72, 73). The corresponding values of factor loadings for the seven subjects are given in Table 2 (pages 74, 75) where the percentage of the total variation explained by each of the factors is also given.

The first factor explains about 55 per cent of the total variation in the Arts samples and between 60 and 65 per cent of the variation in the Science samples and there is no difficulty in identifying it, as usual, as the General Ability factor. The loadings also show that the pattern of the first factor is more or less the same for the three centres and for the pooled data, and this is true for Arts as well as for Science.

When we come to the second and third factors, however, the problem of interpretation becomes difficult. Also, the interpretation becomes inevitably different for Arts and Science.

[2] For other details about the P.D. examination of the University of Poona and the sampling procedure used by the authors, see *Artha Vijnana, op. cit.*

In the first place we see that, while the part of the total variation explained by the first three principal components is of the order of 75 per cent in Arts, in Science it is much higher, as high as 81 to 83 per cent. This perhaps reflects the greater homogeneity among the Science students as well as in the content of the Science syllabus. Secondly, although the variation explained by the second factor is considerably less than that explained by the first, the variation explained by the third factor is of the same order as that explained by the second. This is true both for Arts and for Science. This suggests that the interpretation of these two factors may be taken together.

The seven subjects in Arts consist of geography, which is more in the nature of a science subject, as against the other six which can be further sub-divided into the group of the three languages and the group of the three non-language subjects, namely, economics, civics and AIC or MW. Again, most of the candidates (of the order of 90 per cent or more) answer all their papers (except the one in English) in the Marathi medium.[3] It seems two facts are reflected in the factor patterns of the second and the third factor for Arts. For instance, the third factor in the Poona group and the second factor in the Old Centres group clearly reflect the contrast between English and other subjects. Although it does not appear to be identifiable in the New Centres group, the third factor in the pooled data perhaps indicates the same thing in another form; here the division seems to be broadly along language subjects versus non-language subjects. The third factor for the Old Centres group indicates clearly the contrast between geography and other subjects. The same perhaps appears in the form of more or less "exact" subjects (geography and economics) against other "non-exact" subjects in the second factors for the New Centres group and for the pooled data. It is, however, difficult to interpret the second factor in the Poona group. Another interesting feature is the low factor loadings for Marathi for the second and third factors in most cases; this perhaps reflects the fact that Marathi being the mother tongue of the candidates, most of its effect is extracted in the first factor of general ability.

In the case of Science it should be observed at the outset that the papers in the first five subjects, which include the three Science subjects and mathematics, are answered in the English medium by all the candidates, the option of the Marathi medium being available only for the MIL and the Additional Arts subject. (This is exercised in favour of Marathi by about 40 per cent of the candidates in the case of the Additional Arts subject[4]; the paper on the MIL is answered in that language.) There is no doubt that the second factor in the separate data for the three groups of centres as well as in the pooled data reflects the contrast of the Arts subjects against the Sciences (including mathematics). From the pattern of signs it appears that the third factor reflects the contrast of the relatively descriptive or "non-exact" subjects (English and biology) against the non-descriptive or "exact" subjects (physics, chemistry and mathematics) among the first five subjects. This is clear in the case of the pooled data as well as for the Poona and Old Centres groups but not so clear in the New Centres group. It is also interesting to note that the loadings in the first factor (for the three separate groups as well as for the pooled data) also point to the dichotomy of subjects; the loadings for the Science subjects, including mathematics, are as a group higher than those for the three Arts subjects. This indicates that the general ability factor for the Science candidates consists primarily of ability in the Science subjects. This is as it should be.

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[3] See A.R. Kamat and A.G. Deshmukh. *Wastage in College Education*, Part II. Asia Publishing House, 1963.

[4] See A. R. Kamat and A. G. Deshmukh, *op. cit.*

A. R. Kamat is Head of the Department of Statistics and Joint Director, Gokhale Institute of Politics and Economics, Poona.

A. G. Deshmukh was till recently a Research Scholar at the Gokhale Institute of Politics and Economics, Poona. He now works with the University Grants Commission, New Delhi.

R. K. Pandit works at the Gokhale Institute of Politics and Economics, Poona.

Research on Personality Correlates of Academic Achievement— A Critique

R. P. Bhatnagar

The study of factors of academic achievement had claimed the attention of researchers even before 1930, by which year a number of studies had been undertaken. These were reviewed by Harris (1931). In the years between 1930 and 1937 greater research enthusiasm was shown in this area and Harris (1940) published another review of 328 studies made during this period. Emme (1942) similarly reviewed studies conducted in 1941. Garrett (1949) reported about 63 studies in which personality factors were studied as predictors of academic achievement. The reported correlations of these factors with college grades varied between –0.30 and +0.64. Beasley (1957) reviewed research on factors of academic under-achievement, and Gowan (1960) summarized studies on factors of academic achievement.

The investigations so far undertaken have tended to focus upon a wide variety of personality traits hypothesized as factors of academic achievement. From such deep seated aspects as ego-organization and identification processes through emotional adjustment, self-concept, neuroticism-extraversion and socialization to motivational factors, especially personality needs, a vast continuum has served as the basis of these investigations.

Several reviewers (Garrett, 1949; Gowan, 1960; Harris, 1931; Harris, 1940) have tried to formulate a comprehensive and integrated picture of personality factors contributing to academic achievement in schools and colleges. But the picture does not appear to be quite meaningful in the absence of uniformity or consistency of relationship between personality traits and academic performance in different replications of the experiments. Findings, oftentimes, are contradictory. Because of several reasons the results of the investigations are not comparable and generalizations about the personality factors of academic achievement cannot be made. As Gowan (1960) puts it, the "problem appears more complex than was at first indicated, and contradictory and unexpected findings have muddied the waters". Most of the findings however urge one to believe that personality factors are important conditions of academic achievement. But when it comes to the question of which particular condition contributes to what extent and in what direction, the answers are highly confusing.

Broadly speaking this state of confusion arises from the following reasons:

1. Use of a wide variety of tools;
2. Use of tools, which are not perfectly valid, in the measurement of personality factors and academic achievement;
3. Heterogeneity of samples in characteristics like age, ability, religion, class, school systems, etc.
4. Inadequate control of correlated variables;
5. Inability to define personality traits more precisely;
6. Application of diverse methods of identifying under-and over-achievers;
7. Inherent weaknesses of the test of significance used in most of these studies.

VARIETY OF TOOLS

A wide variety of psychological tests have been used in these studies for assessing personality characteristics. Rorschach, T.A.T., Incomplete Sentence Blanks, inventories and questionnaires, have all been utilized. Obviously, therefore, the results cannot be expected to be comparable, as no two tests measure exactly the same thing, unless they are designed as such. The needs measured by the T.A.T. do not have the same connotation as the needs measured by the E.P.P.S. Similarly, the emotional adjustment assessed through the interview technique is not the same thing as the emotional adjustment assessed through standardized inventories like California Psychological Inventory or Bell's Adjustment Inventory. This situation makes generalizations about the personality factors of achievement impossible.

VALIDITY OF TOOLS

The use of tests of personality which are not sufficiently valid is another cause of confusion. It is very difficult to state unquestionably what exactly is measured by a particular test. No test measures more than what is contained in its items; and what is contained in the items cannot be truly known because of the lack of a pure criterion. It is difficult to say what kind of need achievement is measured by the T.A.T. and what kind by the E.P.P.S.; hence attempting any generalization about the relationship of need achievement with academic achievement from two studies using these two tests is a difficult task.

HETEROGENEITY OF SAMPLES

Another source of confusion is the heterogeneity of the samples. The results from a study in which a sample of college students has been used cannot be compared with those from a study based on a sample of high school students. Similarly, results of the studies of gifted children cannot be expected to be exactly identical with the results of studies in which students of all levels of ability have been used. Again, the results obtained in two different cultural backgrounds also may not be comparable. Sometimes, even results obtained from samples drawn from two different school systems become uncomparable.

INADEQUATE CONTROL OF CORRELATED VARIABLES

This appears to be a major cause of confusion. In many studies, even the most relevant factors have not been controlled. In the absence of such control it is difficult to take for granted that the relationship emerging between personality and academic achievement is the true one. It may be the relationship resulting from the combined effect of several other extraneous factors. In most of the studies in which the test of significance has been used, it has been discovered that this situation renders the findings less genuine. Obviously, therefore, the results obtained from such studies cannot be compared with those of other studies which have adopted more rigorous control of correlated variables. In these studies however, the variables which have been controlled are not the same in all cases. The results of the various studies therefore carry the effects of different variables, and hence they cannot be considered quite comparable.

IMPRECISE DEFINITION OF PERSONALITY TRAITS

It is not only the tools for measuring personality which create difficulties. The various personality traits and the different meanings attached to them also create problems. In several cases the definitions of the personality variables lack precision. In the majority of the cases, variables have been defined only operationally. But operational definitions do not permit generalizations beyond the psychological content of the test items. For example, achievement motivations as measured through McClelland's T.A.T. (MAMT), French Achievement Scale, E.P.P.S. and T.A.T. cannot possibly carry the same meanings. And from studies employing personality variables, which carry different connotations, generalizations become impossible.

The concept of motivation is still crude. Most of the tools measure need achievement in terms of "energy output" or "amount of production". But the definition of motivation in these terms is still not acceptable to many psychologists. A number of them believe that motivation is not a unitary and general trait. In one situation or in the case of one individual, it may mean a strong desire for success in academic courses and in the case of another, a strong desire to be popular and socially recognized. No measure of general achievement motivation can predict specific achievements, as for instance in these situations, accurately. Hence, the same magnitude of correlation with the criterion in any two studies cannot be interpreted in the same way. In view of these limitations, it seems that inferences of wider application and of a general nature cannot be drawn from these studies.

IDENTIFYING UNDER- AND OVER- ACHIEVERS

Most of the studies in which the relationship of personality factors with academic achievement has been investigated have utilized the extreme groups of under-achievers and over-achievers, and by comparing them have tried to draw inferences about personality variables as predictors of academic achievement. But they have not adhered to any one particular method of identifying these groups. Different methods do not yield the same groups of subjects and hence not the same sets of personality characteristics predicting academic achievement. As regards the achievement criterion, the under- and over-achievers have been identified on the basis of grade-point averages (GPA), school marks and scores on standardized achievement tests. These methods may not all identify the same individuals as under-achievers or over-achievers, thus making comparisons or generalizations difficult. Again, some studies have used predicted scores and deviation scores for identifying these two groups, while others have used scores obtained at a particular time and have identified the groups by using scatter-diagrams. Here also it cannot be expected that the same under-achievers and over-achievers will constitute the two groups. The unreliabilities of school marks and low validities of the intelligence tests complicate the problem still more.

TEST OF SIGNIFICANCE

In most of the studies the 't'-test of significance for determining valid personality factors of academic achievement has been applied. The investigators have tested significance of the differences between personality traits as shown by the groups of under-achievers and over-achievers on the personality measures which they have used. From these significant differences, inferences have been drawn about the general relationship between personality variables and academic achievement.

The test of significance, however, has its own weaknesses. Some research workers (Coleman, 1956; Selvin, 1956; Selvin, 1957; World, 1956) have felt that such tests do not perform a valid function in sociological research. The method is applicable only to laboratory experiments in which it is possible to secure adequate experimental control of the independent variables. This control is not possible in sociological research and therefore the observed differences may be a combination of "treatment effects" and of uncontrolled variations in the experimental subjects. These errors may be minimized by controlling all relevant correlated variables either in the beginning or by cross-tabulation after the data have been gathered. But in the majority of studies this has not been done; hence it is difficult to assume that the results of different studies are comparable among themselves.

A more meaningful approach to generalization about personality correlates of academic achievement seems to be to compare studies employing the same age and class groups of subjects, based on the use of the same tools and following the same experimental designs. From the point of view of research and practical applicability to education, generalizations obtained in this way may be more useful.

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R. P. Bhatnagar is Reader in Education at the Regional College of Education, Ajmer.

Job Satisfaction—
A Summary of Research

Pritam Rohila

Work occupies an important place in the life of man. It is a major source for the satisfaction of the biological, psychological and social needs of the individual (Roe, 1956), as well as the best single determinant of social class (Kornhauser, 1955; Warner *et al.*, 1949). Suitability of work, therefore, is very important for job satisfaction and the general mental health of the individual (Brayfield and Morsh, 1957; Friesen, 1952; Heron, 1955; Inlow, 1951; McMurry, 1932; Smith, 1936; Stapel, 1950; Weitz, 1952).

Job dissatisfaction has been found to be associated with a higher rate of absenteeism (Jackson, Rittig and Pasamanick, 1957; Sinha and Nair, 1965; Sinha and Singh, 1961), turn over (Loken, 1951; Palmer, Purpus and Stockford, 1944), accidents, wastage, industrial strife, and with a lower rate of production (Brayfield and Crockett, 1955; Sinha and Nair, 1965). It not only results in unhappiness to the individual, but also leads to wastage of the human and material resources of society.

FACTORS AFFECTING JOB SATISFACTION

A. Job Variables

Jobs vary with respect to the nature and pace of work, level and type of skills, interests and abilities required, physical and social environs, and rewards yielded; therefore they vary in the type and amount of satisfaction they yield to the worker.

Work

All types of work are not inherently satisfying. People engaged in work which is not satisfying in itself, therefore, tend to look for satisfaction from sources external to it. Too much specialization in work processes has been found to affect satisfaction as well as productivity (Cozen, 1959; Mackinney, Wernimont and Galitz, 1962), partly because the small units into which the working tasks are split require far less of the worker than he is capable of giving by way of skill, ability or interest, and partly because the worker is deprived of the satisfaction that accrues from doing the job in full. When jobs are made relatively more complex, production tends to increase, turnover decreases, and work satisfaction and interest tend to become greater (Darley and Hagenah, 1955). Repetitive and routine type of work has frequently been found to decrease the worker's satisfaction. But the meaning of repetition and routine seems to differ from one individual to another (Super, 1957).

The physical situation

If the physical environment in which the work is done is unhealthy, it may contribute to a sense of uneasiness in the worker. Work done in poor physical conditions over a long period of time may result in dissatisfaction with the job. Numerous studies conducted in Britain have shown how lighting, temperature, noise, etc., affect the efficiency and personal well-being of the worker (Smith, 1945).

The social situation

In a number of studies a definite relationship has been found between vocational adjustment of workers and the role of supervisors. The performance and morale of employees are more strongly influenced by their supervisors than by any other factor in the work environment (Hersey, 1955; Kahn and Katz, 1953; Picken and Tayback, 1957). Working with a group of teachers, Bidwell (1955) noted that when the behaviour of the administrators conformed with the teachers' expectations of the former's role, satisfaction was high; non-conformity produced high dissatisfaction. The quality of the expectations did not produce any difference in satisfaction so long as the expectations were fulfilled. Heron (1954), observed a correlation of 0.37 between the satisfaction of bus drivers as measured by a job satisfaction inventory and satisfactoriness as measured by the employers' ratings of the employees.

Job satisfaction has been found to be significantly related to the worker's relationships with and status among his co-workers (Picken and Tayback, 1957; Van Zelest, 1951; Zaleznick *et al.*, 1958). Other things being equal, good relationships with colleagues go with a high degree of job satisfaction.

Organization

Workers employed in small and well-integrated organizations are more satisfied than those employed in large and poorly integrated organizations. A decentralized organization provides each individual with more freedom and opportunities for self-expression and hence workers in such an organization are likely to be better adjusted than those in a centralized organization (Smith, 1961; Worthy, 1950).

Occupational status

Occupational status has been found to be definitely related to job satisfaction (Strong, 1955). A number of studies have noted a rise in job satisfaction with rise in status (Bell, 1937; Centers, 1948; Form and Geschwander, 1962; Fortune Quarterly Survey, 1938; Harrell, 1959; Hoppock, 1953; Hull and Kolstad, 1942; Paterson and Stone, 1942; Super, 1939; Thorndike, 1955; Uhrbrock, 1954). Zaleznick and associates (1958) in an intensive study of one department of a manufacturing company found that even small differences in status could produce large differences in satisfaction. Among white collar workers, satisfaction has been found to be the highest among professional workers and executives and the lowest among commercial and clerical workers, while among manual workers the skilled have been observed to reveal the highest degree of satisfaction, and the unskilled the lowest. Skilled workers actually surpass commercial and clerical workers in the degree of satisfaction (Morse, 1953; Super, 1939). These findings led Super (1939) to conclude that there are, in fact, two occupational scales with respect to job satisfaction: a white collar scale and a manual workers' scale.

Differences have been noted among different occupational level groups in the sources of job satisfaction (Centers, 1948; Strong, 1955; Troxell, 1954). Workers in the lower level occupational groups have been found to place more emphasis on income and security, while in the case of those in the higher level occupational groups the emphasis is on interesting and challenging work. Darley and Hagenah (1955) similarly observed that below some cut-off point in the occupational hierarchy work is primarily a means to the end of survival and minimal subsistence, and the tasks of jobs are not in themselves interesting, challenging or satisfying. They state that extrinsic incentives are likely to increase the job satisfaction of the workers employed in the lower level occupations.

B. PERSON VARIABLES

Individuals differ in age, sex, family background, marital status, education, abilities, interests, needs and values. They also differ in the amount and type of satisfaction sought in work. Consequently they differ in the degree of vocational adjustment.

Biographical factors

A curvilinear relationship has been noted between job satisfaction and age (Ganguli, 1955; Hull and Kolstad, 1942; Morse, 1953; Super, 1939). Working with 273 employed men between the ages of 20 and 68, Super (1939) found that job satisfaction is cyclical. The beginning workers face some problems of adjustment to the work, including its physical and social environment as well as the changed expectations of the family and the community. Most individuals are able to deal with these initial adjustment problems more or less effectively, and they report higher satisfaction after a few months on the job. Around the age of 25, the anxiety to advance more rapidly is marked among most young workers. It increases as they advance in age and results in dissatisfaction. Around 35, most people try to settle down in their work. For those who are successful in finding a place which allows them to play the role they want to, it is a period marked by satisfaction with their achievement. For others, who fail in their efforts in this direction, the period is characterized by resignation and contentment with what they have, for few can afford to take risks and break new ground at this age. The period between 45 and 55 is characterized by less satisfaction. Work during this period, for most people, loses some of its attractions while other types of satisfaction have not yet developed. Around the age of 55 most people are satisfied and eagerly look forward to the time when they would have ample opportunity to do whatever they like. However, there are some persons who chronically report low satisfaction (Strong, 1955).

Women more than men have been found to be better adjusted in their jobs (Newman, 1952; Sueher, 1962; Zaleznick, 1958). This finding may be explained in terms of the generally lower vocational aspirations of women and the sex differences in work motivation. In many studies women have been found to have more realistic vocational aspirations. For many women, work is an escape from the drudgery of housekeeping.[1] It is a source for a definite status in the family and among associates, and for greater independence and security.

Sex differences have also been noted in the reported sources of satisfaction or dissatisfaction. Male teachers, for example, were found to place salary first as a source of dissatisfaction whereas female teachers placed it fifteenth (Sueher, 1962).

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[1] In a survey conducted in Delhi recently by the Delhi School of Social Work, one of the important reasons why women seek employment was found to be the opportunity it affords them to engage in a purposeful activity. *The Hindustan Times*, 12 April 1965, p. 3.

Married individuals have been found to express more satisfaction than unmarried ones (Inlow, 1951; National Education Association, 1956; Sinha and Nair, 1965). Other investigators have found dissatisfaction with salary to increase with a frustrated desire for children on the part of sterile respondents.

Family background has been found to be a significant determinant of vocational adjustment. The U.S. Department of Labour (1949) in a follow-up study of school leavers noted that a well integrated family life seemed to increase the likelihood of satisfactory vocational adjustment. Sueher (1962) working with teachers found the childhood background to be highly related to their vocational adjustment. Teachers with high morale as compared to those with low morale indicated that both their parents were happy in their respective occupations, that their childhood family was very close, and that they had fulfilled their parents' expectations.

Inverse relationship was observed between the degree of job satisfaction and level of education in studies by Sinha and Nair (1965), Vollmer and Kinney (1955) and Walker and Guest (1952). This is probably due to the changes in aspirations and needs and values which accompany higher education. Some evidence in support of this hypothesis is afforded by Troxell (1954). Working with 705 male workers employed in various occupations, he found that the more educated workers tended to place greater emphasis on interesting and challenging work as factors related to job satisfaction while those with less education tended to give more emphasis to such factors as income, security and fair supervision.

Psychological factors

Super (1939) in his sample of men employed in occupations at different levels found that the lack of suitability of job requirements to the individual's abilities was one of the primary reasons for dissatisfaction. Harrell (1959) and Smith (1955) noted a varying relationship of intelligence to vocational adjustment.

Hutchinson (1952) in his study with elementary school teachers, Strong (1955) in his follow-up study of Stanford graduates, and Jaques and Crook (1946) in their study with soldiers found positive and significant relationship between measured vocational interests and job satisfaction. But the relationship observed was not very high,[a] most probably because measurement of interests tends to concern itself with defining satisfaction inherent in the job itself, whereas all jobs do not possess such sources of stimulation; nor is everyone motivated to find work as an end in itself (Darley and Hagenah, 1955).

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[a] In Strong's study correlations ranged between 0.23 and 0.30.

The studies of Friend and Haggard (1948), Schaffer (1953) and Walker and Marriott (1951) with various groups of professional and manual workers have shown a significant relationship to exist between the psychological needs of individuals and job satisfaction. Schaffer (1953) observed that over-all job satisfaction is a function of the extent to which those needs of the individuals which can be satisfied in a job are actually satisfied, and that the stronger the need, the more closely job satisfaction depends upon its fulfilment. He obtained a coefficient of correlation equal to 0.58 between the mean job satisfaction score and two of the strongest needs of workers drawn mainly from professional, managerial, clerical and sales occupations.

Although aspirations are not highly related to ability, interest or status, these play an important role in vocational adjustment. The size of the gap between the aspired for and the actual occupational levels, incomes, recognitions and occupational roles has been found to be negatively and significantly related to satisfaction among industrial workers, psychologists, nurses, teachers, office workers and other occupational groups (Brophy, 1959; Gadel and Kriedt, 1952; Ganguli, 1955; Handyside, 1961; Jackobson, Rettig and Pasamanick, 1957; Rettig and Pasamanick, 1959; Super, 1939).

Personal-social adjustment has been found in a number of studies to be related to vocational adjustment. Friesen (1952), Heron (1955) and Inlow (1951) found a positive and significant correlation of vocational adjustment with personal and social adjustment. It is difficult, however, to determine the cause and effect relationship between vocational maladjustment and personal-social maladjustment. "One is a measure of the other; neither is prior to, nor independent of the other; both are indicative of the person in the world". (Roe, 1956, p. 285).

A variety of factors thus influence job satisfaction. Generally, none of these factors by itself produces satisfaction or dissatisfaction. Apparently, they are most effective when they operate together, each strengthening the other. On the other hand, any factor in the work situation may become a source of satisfaction or dissatisfaction. It is not seldom that factors apparently far removed from the job and the worker affect job satisfaction.

Most of the studies reviewed in this section have used the factorial approach to the problem. Although this approach has proved fruitful, there is an express need for studies based on the holistic-developmental approach. Dubin's (1958) attempt to distinguish three broad types of persons with respect to vocational behaviour and adjustment, namely the work-oriented person, the community-oriented person and the indifferent person, seems to be promising.

IMPROVING VOCATIONAL ADJUSTMENT

Incentives are helpful in reforming the individual's attitude to his job if they are suited to his needs. Enlargement of the job, changes in the hours and pace of work and in tools and materials, improvements in physical surroundings, changes in strength and organization of the work group, decentralization of administration, and changing the supervisor's role from that of a superior and a finder of faults to that of a friend and guide may also be helpful to some extent.

Employee counselling is helpful in assisting the individual to make a better adjustment in his job. The worker is offered an opportunity to talk out his feelings of dissatisfaction. This by itself provides some relief. If the sources of dissatisfaction lie outside the work situation, he is assisted in coping with those problems. Roethlisberger and Dickson (1939) presented evidence to suggest that this approach was effective in reducing, if not eliminating, vocational maladjustment.

Guidance services in educational institutions and vocational counselling and placement services in employment exchanges are designed to this end. Studies reported by Cuony and Hoppock (1954), Kessler (1954), Shosteck (1953) and the U.S. Department of Labour, Bureau of Labour Standards (1949) have brought forth evidence to show that guidance services do serve this end. Cuony and Hoppock in a follow-up study of high school leavers found that those who, as senior students, had been taught a course in job finding and job orientation and had received more counselling, were more satisfied with their jobs and earnings than an equated control group. The U.S. Department of Labour conducted a follow-up of 524 boys and girls who had left school and were in the labour market. It was found that those who were the least satisfied with their jobs had no vocational plans and had received little or no help in this direction when they were in school. They lacked information and had almost no idea of their own abilities and interests. Even at the time of the follow-up they did not know where to get assistance from. Shosteck, in a comparative study of female college graduates who had made use of the college counselling service, and those who had not, found that more of the former were satisfied with their jobs. Working with 477 rehabilitated veterans, Kessler found a high correlation between job satisfaction and the veterans' satisfaction with the vocational guidance given to them by the Veteran Administration.

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Pritam Rohila is a Counsellor in the Department of Psychological Foundations, National Council of Educational Research and Training, New Delhi.

Desai-Bhatt Group Test of Intelligence in Gujarati

Champa L. Bhatt

This research was undertaken by the author at the A. G. Teachers Collge, Ahmedabad.[1] The original Desai Group Tests of Intelligence were standardized by K.G. Desai in 1951. These tests have been widely used in Gujarat to appraise the intelligence of pupils in grades VII to XI.

Though the tests have been found to work quite well, the author felt that a revision in the light of the changed social and educational conditions might be taken up with advantage. Though the original author and the present investigator both subscribe to the hereditarian theory of intelligence, they expect that since a test utilizes materials from the environment in which it is to be used, and since environments normally undergo change, some items of every test will in time become culturally obsolete. Such items are likely to affect test scores (Freeman, 1963).

Thus this research was begun as a revision but two practical considerations ultimately turned it into the development of a new test. One of them was to simplify the procedure of test administration. The original test is a battery of ten sub-tests each of which needs separate instructions and timing. The present test is designed on the omnibus pattern with an over-all time-limit, for such a test is easier to administer. Many of the sub-tests in the original battery did not fit into the omnibus pattern and had to be altered or completely excluded. This necessitated the coining of many new items. The other practical consideration was to minimize the cost by designing a re-usable test booklet with a separate answer sheet. It was felt that educational practices from about 1960 onward gave pupils opportunities to become fairly well acquainted with objective tests and therefore a separate answer sheet would not vitiate the scores.

[1] The study was supported by a research grant from Gujarat University.

CONSTRUCTION OF THE TESTS

This investigator aligns herself with Spearman in so far as types of tests known for their saturation are selected and the measure of brightness obtained by adding scores on all of them. The types of tests included are :

1. Following directions
2. Opposites
3. Disarranged sentences
4. Classification
5. Meanings of proverbs
6. Number sequence
7. Analogies
8. Differentiation
9. Arithmetical reasoning
10. Verbal reasoning

Sixteen items of each type, some selected from the original test but most of them newly coined, were prepared. All the 160 items were arranged into 16 sets so that each set was made up of ten items and included one item each of the ten types of tests mentioned above. The first set was used as a practice test and the remaining 15 for item analysis.

ITEM ANALYSIS

The test containing 160 items, including ten for the practice test, was administered to about 550 boys and girls studying in grades VIII to XI of schools in Ahmedabad and other semi-urban areas of Gujarat. No time-limit was imposed for it was necessary that each testee should try every item. Out of this group, 370 pupils, who were neither too young nor too old for their grade, were selected and their responses used for item analysis. The method adopted was Item Analysis with Extreme Groups. The top and the bottom 27 per cent of the total group were analysed with a view to gaining economy of computation and increased precision, for the ratio of the obtained difference to its standard error is the maximum when the top and bottom group each includes approximately 27 per cent of the total population tested (Thorndike, 1954).

The difficulty and the discrimination indices for each item were read from the Psychometric Research and Service Chart of Harper and others (1962) showing the Davis Difficulty and Discrimination Indices for Item Analysis. The percentages used for reading these from the chart were the ones corrected by Horst's formula, for that takes into account the strength of the distractors also. Items of poor discrimination value were discarded. Out of the good items, the best ten from each of the ten types were selected to be incorporated into the final form of the test.

They were then arranged in the order of their difficulty indices. Table 1 summarizes the selection of the items for the final run of the test.

TABLE 1

SELECTION OF ITEMS FOR THE FINAL FORM

	Preliminary form	*Final form*
No. of items borrowed from the original Desai Group Tests	17	13
No. of items modified from the Desai Group Tests	46	32
No. of items newly coined	87	55
Total No. of items	150	100
No. of items of poor discrimination	33	...
No. of other items rejected	17	...
No. of items retained	...	100

45 items out of 210 of the original Desai Group Tests were incorporated in the 100 items selected for the final form of the present test. Out of these 45, 32 were modified to make them more suitable and 13 were retained in their original form.

FIXING THE TIME-LIMIT

Before administering the test to a large population for standardization, it was necessary to fix the time-limit. No attempt was made to render the present test into entirely a speed or a power test. It is generally accepted that any speed test is a power test to the extent that it includes tasks of varying difficulties, and any power test is a speed test in so far as a time-limit is imposed. Experts do not agree as to the definitions of "speed", "power" and "difficulty". Besides, the question whether intelligence is a function of speed or power or of both is controversial. Quite a few believe that speed and power act and react upon each other in an intimate and not wholly predictable manner (Wechsler, 1957).

The best way out seemed to be to fix a time-limit so that the pupils would not have to work at breakneck speed. To study the effect of the various time-limits, the test was administered to 175 boys and girls studying in grades VIII to XI in an average school in Ahmedabad city. It was observed that approximately 2 per cent could finish in 35 minutes, 12 per cent in 40 minutes and 34 per cent in 45 minutes. Hence 40 minutes was fixed as the time-limit for the test. The original Desai Group Tests allow 40 minutes for 210 items. As such the present test is less speeded.

THE FINAL RUN OF THE TEST

The test is designed for use with pupils studying in grades VIII to XI of secondary schools all over Gujarat. In view of this range of applicability, the test material was based on experiences common to pupils living in various parts of Gujarat. But this was not deemed sufficient to minimize the effect of environmental differences between the urban and the non-urban areas on the test scores, for in spite of such attempts many studies have revealed a bias in favour of the urban pupils. It was therefore decided to develop separate norms for the two areas. However, the financial resources for the present research were limited, and rather than develop two types of norms on inadequate sample populations, it was decided to prepare norms for the urban areas alone and leave the others to a future opportunity.

Stratified sampling procedures were used and schools were selected as per three types—academically advanced, average and backward. One section each of the four grades was taken up from each of the six schools so that the three academic types, the four school grades and the two sexes might be represented in a fairly comparable proportion. The age and grade analysis of the 1,106 boys and 897 girls tested is given in Table 2.

The test administration was carried out within a period of 15 days by the makers of the test and their two colleagues who had quite some experience of administering psychological tests.

TABLE 2

AGE AND GRADE-WISE ANALYSIS OF THE SAMPLE FOR THE FINAL RUN

Age	*Grades*								*Total*	
	VIII		*IX*		*X*		*XI*			
	Boys	*Girls*	*Boys*	*Girls*	*Boys*	*Girls*	*Boys*	*Girls*	*Boys*	*Girls*
11	29	13	...	...	.	...	...	.	29	13
12	117	97	24	14	5	3	...	...	146	114
13	68	66	98	78	23	14	1	...	190	158
14	31	24	107	70	88	69	16	8	242	171
15	28	16	43	41	66	70	81	61	218	188
16	7	5	14	21	42	41	69	50	132	117
17 and above	4	1	7	12	49	32	89	91	149	136
TOTAL	284	222	293	236	273	229	256	210	1106	897

STANDARDIZATION

Norms

The test comprises 100 items and one mark is assigned to each. The raw scores were used for fixing the norms without any application of weights or correction.

The mean and the median scores for each age group were calculated separately for boys and girls, and tabulated as shown in Table 3.

TABLE 3

AGE NORMS

Age	*Boys*					*Girls*				
	N	*M*	*Md*	*SD*	*Norm*	*N*	*M*	*Md*	*SD*	*Norm*
11	29	41.00	41.38	9.15	42	13	44.31	43.25	14.20	36
12	146	46.21	45.33	11.81	45	114	38.30	37.94	13.13	38
13	190	49.55	48.20	12.40	48	158	40.64	40.33	15.13	40
14	242	50.10	50.57	14.28	51	171	42.50	41.71	14.47	42
15	218	53.22	53.20	13.23	53	188	44.74	42.70	15.71	43
16	132	52.00	51.27	13.09	55	117	42.39	42.00	15.13	44
17 and above	149	48.04	48.25	11.98	55	136	39.39	38.75	10.50	44
TOTAL	1106			13		897			15	

The median score was taken as the norm after correcting the abnormalities (as shown in the curves of growth of intelligence in Fig. 1.).

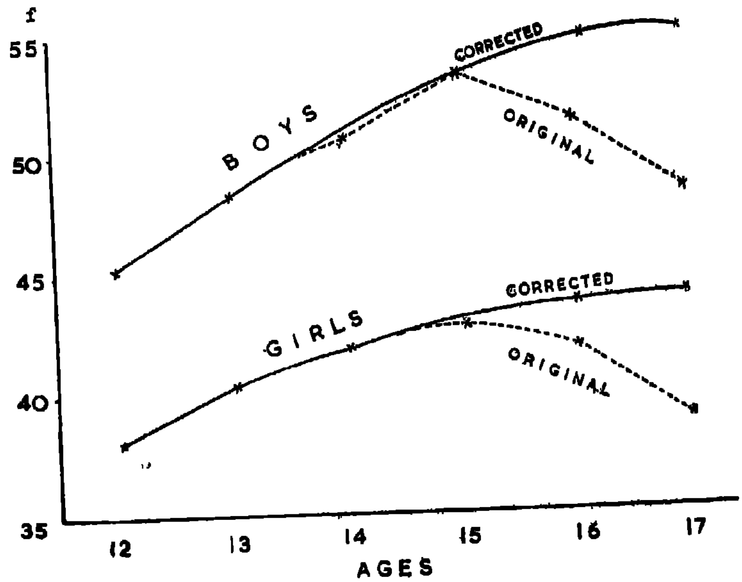

Fig. 1. *Curves of growth of intelligence*

The abnormality in the case of the 11-year age group can be explained as an extremely small sample. Those in the case of the 17-and-above age group are also not unexpected. As 5 is the normal age of entrance to grade I, most of the pupils falling in the age group 17-and-above are bound to be retarded, and hence the lower median scores in that group. The age group 16 is also slightly truncated as some of them have already passed the S.S.C. examination and gone to college. It is not unusual for test makers to face such truncated data. As was done in the original Desai Battery, so in the present standardization, too, the norms are corrected, where required, from the curves of growth of intelligence plotted from the median scores.

Measure of brightness

The "deviation IQ" which is an adaptation of the standard scores, and hence statistically sound, is taken as a measure of brightness. The advantages of this method are described by Wechsler (1957). In his opinion, it dispenses with all assumptions as regards the precise relation between intellectual and chronological ratings of growth, and in particular, assumptions as regards the rectilinear relation between the M.A. and C.A. He further adds that the method enables us to calculate IQs which maintain the same meaning throughout the life of the individual, and that it retains the original and only important meaning of the IQ, namely, an index of relative brightness.

There is warranted criticism against the use of the term "intelligence quotient" popularly employed even for the "deviation IQ". However, it is permitted provided that the SD is approximately equal to that of previously known IQs (Anastasi, 1962). As the SD of IQs (viz., 16) employed in the present test is equal to that of N.N. Shukla's adaptation of the Stanford-Binet Test in Gujarati, the term IQ has been legitimately used in the present standardization to denote the index of brightness.

Calculation of IQs

From Table 2 it was observed that the SD of the distributions of scores of the different age groups (except some with truncated data) was about 13 in the case of boys and 15 in the case of girls. As mentioned in the preceding paragraph, 16 was taken as the SD of IQs in reporting the standard scores. The raw scores were then converted into PRs and IQs and a ready reckoner was prepared.

The distribution of IQs of the boys and girls of the norm group is shown below in Figures 2 and 3 (page 103). As the IQs of pupils of age 11 and 17-and-above, which had truncated samples, would make the curve skewed, they have not been included in the distribution here.

The distribution of IQs of boys is slightly skewed to the positive side, the value of skewness being 0.225. The distribution of IQs of girls also shows slight positive skewness, the value being 0.255. This is exactly what would be expected, as some of the brighter boys and girls of age 16 have already passed the S.S.C. examination and gone to college. Secondly, all those whose IQs were estimated as below 70 have been included in the interval 70-74, since it is felt that one whose IQ is really below 70 cannot reach grade VIII at all. Those who scored very low either did not follow the test items or were less motivated. They are therefore grouped in the interval 70-74.

Classification of IQs

As the tests are designed for the use of schools, it is necessary to give popular meaning to the various ranges of IQs. The classi-

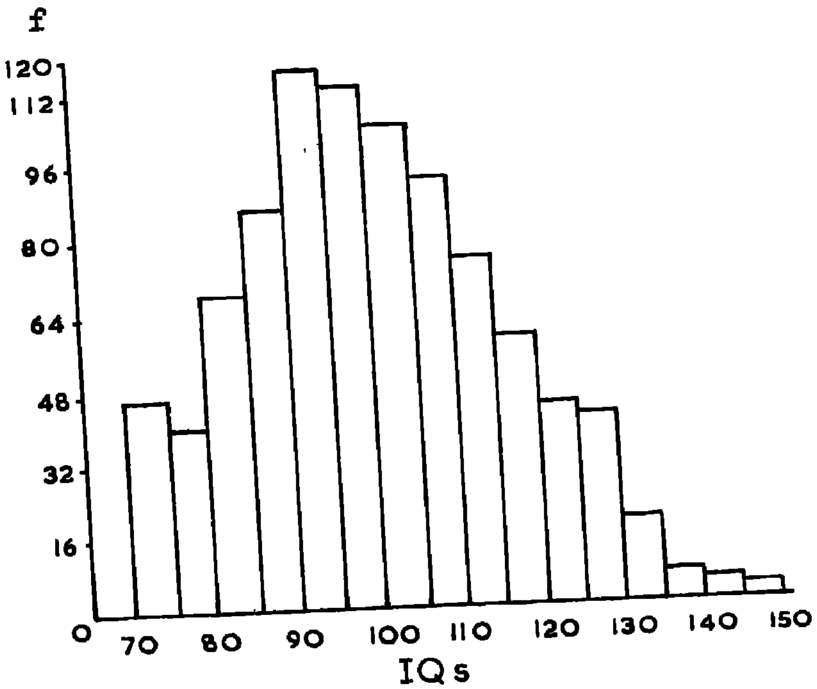

Fig. 2. *Distribution of Desai-Bhatt IQs of 928 boys*

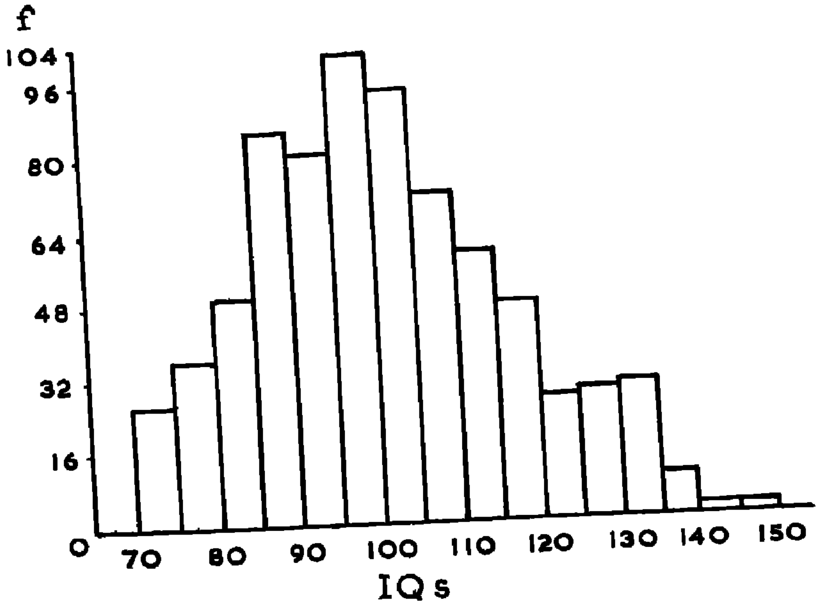

Fig. 3. *Distribution of Desai-Bhatt IQs of 748 girls*

fication of the IQs obtained on the present test is therefore suggested as in Table 4. The percentages of pupils tested falling in different categories are also shown.

TABLE 4

CLASSIFICATION OF IQs

IQ	*Classification*	*Percentage of cases*	
		Boys	*Girls*
140—149	Extraordinary	1.2	0.6
130—139	Very Superior	2.8	5.2
120—129	Superior	9.4	7.1
110—119	High average	14.5	14.1
90—109	Normal or average	46.2	46.6
80—89	Low average	16.8	18.2
70—79	Very backward	9.1	8.2

Reliability

1. The Sub-divided Test Method, popularly known as the split-half method, was used for determining the reliability of the test. The odd-even procedure could be adopted in splitting up the test, for the items are graduated according to difficulty. In doing so, an entire block of ten items, including one item of each type of test, was to be treated as one unit so that the score on items included in blocks 1, 3, 5, 7 and 9 gave the score on odd items and those in the remaining blocks gave the score on even items. The product moment r calculated on a sample of 74 boys and 40 girls was found to be 0.86, $SEr=0.013$. Using the Spearman-Brown formula, the reliability coefficient for the whole test was found to be 0.925.

2. The Test-Retest Method was used by administering the test again to 97 boys and 50 girls after an interval of four months. The product-moment r between the scores in the two testings was found to be 0.84, $SEr=0.025$, and the average increase in the score was 10.1.

3. The standard error of measurement is often used as an estimate of absolute reliability, for the reliability coefficient is an estimate of relative reliability. The $SE_{m\,as}$ for the split-half and the test-retest coefficients were found to be 3 and 5 respectively. SE_{meas} shows the standard error of the obtained score on the test. It would be interesting to know the standard error of the estimated true

score on the test also. SE_{est} was found to be 4 as per the split-half reliability and 5 as per the test-retest reliability.

The index of reliability which shows the correlation between obtained scores on the test and true scores in the function measured by the test was found to be 0.96 as per the split-half reliability and 0.92 as per the test-retest reliability.

Table 5 summarizes the results discussed thus far.

TABLE 5

RELIABILITY ESTIMATES OF THE TEST

Method	*N*	*r*	*SEr*	*SE_{meas}*	*SE_{est}*	*Index of reliability*
Split-half	114	0.93	0.013	3	4	0.96
Test-retest	147	0 84	0.025	5	5	0.92

VALIDITY

1. The congruent validity of the test was estimated by correlating the IQs on the present test with IQs on three other intelligence tests.

(a) The coefficient of correlation with Desai Group Tests of Intelligence was found to be 0.77, SEr=0.037 on a sample of 74 boys and 47 girls studying in grades X and XI. This can be called fairly high in view of the fact that the group is rather homogeneous and that the Desai IQs used here were obtained two years ago.

(b) The same two-year interval exists in the case of the coefficient of correlation with Bhatt Group Tests of Intelligence, which is 0.65, SEr=0.05 on a sample of 86 boys and 49 girls of grades VIII and IX. This is quite appreciable considering the time interval, the homogeneity of the group and the mixed (verbal and non-verbal) tests in Bhatt's battery.

(c) The coefficient of correlation with Bhavsar's non-verbal group test of intelligence (which is now nearing completion) was found to be 0.69, SEr =0.05 on a sample of 80 boys and 40 girls in grades IX,X and XI. This is interesting and important, for the tests are entirely different in nature, the present test being purely verbal and Bhavsar's test being purely non-verbal. The results discussed thus far are summarized in Table 6.

TABLE 6

VALIDITY ESTIMATES OF THE TEST

Criterion	*N*	*r*	*SEr*	*Attenuated r*
Desai Group Test (Verbal)	121	0.77	0.037	0.88
Bhatt Group Test (Verbal and non-verbal)	135	0.65	0.05	0.72
Bhavsar Group Test (Non-verbal)	120	0.69	0.05	0.77

2. The concurrent validity of a test is often estimated by taking into account the number of school grades completed. This is based on the assumption that the more able persons complete more formal education. For this purpose pupils are divided into various groups in view of their age and grade standing. In the present test, as 5-plus is the normal age of school entry, 13, 14, 15 and 16 are taken as normal ages for grades VIII, IX, X and XI respectively. On this basis, pupils who are in a particular grade at an age below the normal for that grade are labelled as accelerated and those in a grade at an age above the normal for that grade are labelled as retarded. The others are labelled as average. The median IQs of each age-wise and grade-wise distribution of IQs, recorded in Table 7, show that in each grade the accelerated pupils, both among boys and girls, have a higher, and the retarded pupils a lower, median IQ than the average pupils. Besides, these median IQs are seen to increase or decrease in proportion to the amount of acceleration or retardation in terms of years.

TABLE 7

MEDIAN IQs OF AGE-GRADE GROUPS

Grade	*Normal Age*	*Age Groups*						
		11	12	13	14	15	16	17
				A. Boys				
VIII	13	100.00	99.03	93.04	82.71	81.50	...	...
IX	14	...	107.00	102.28	93.84	93.56	93.33	75.75
X	15	...	127.00	118.67	110.21	99.50	90.12	83.75
XI	16	...	...	...	121.50	111.69	103.25	95.89
				B. Girls				
VIII	13	103.67	97.79	88.73	83.50	78.63	...	...
IX	14	...	107.00	103.83	98.25	93.00	90.75	89.50
X	15	...	...	117.00	102.00	97.62	92.71	86.16
XI	16	...	...	...	123.00	116.58	106.64	98.38

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Champa L. Bhatt is Reader in Education at the University School of Psychology, Education and Philosophy, Gujarat University, Ahmedabad.

Planning Educational Research[1]

Harold Webster

During the past year there has been renewed effort by various educational organizations in India to conceptualize educational research with the intent of solving serious problems of educational priorities. A nation such as India can ill afford to allocate educational budget unwisely. Yet education has meant so many things, all desirable, to so many people that the task of deciding upon the relative importance of different kinds of educational investment or development has been neglected (Naik, 1965). We have had "expansionism", and not selective development in accordance with assigned priorities.

This is not surprising, however, because education is an expression of the needs of the people, and educational development has nearly always depended more upon these needs, within diverse cultures, than upon conscious and rational planning. The freedom of people to change and develop is hardly ever guided according to strictly rational principles, nor could it be in view of what we now know about human motives and the imperfectibility of logic.

Historically, educational leaders have felt responsible towards students' needs to develop in their own ways. Educators have therefore *not* been among those who initiate drastic or radical social changes—for example, politicians, soldiers, or even laboratory scientists. Teaching has been a nurturant activity, and educators have therefore been more conservers than destroyers, more priests than prophets. As a result educational systems have rarely developed much ahead of other social organizations, and it is only during the last few decades of accelerating technological change that it has been realized that the educational processes, of both the individual and his society, might profitably be studied intensively, using scientific methods.

The topic of this paper is therefore a complex one, for educational research is only now becoming institutionalized as a more or less recognizable speciality.

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[1] Revised version of a paper submitted to the Indian Education Commission.

Perhaps some definitions will help to clarify the discussion:

Education is a process, often referred to as the "educational process", that occurs within persons and that affects and is affected by their social institutions, for example, their family, school, religious group, political organization, etc.

Educational research is the study by scientific methods of the educational process, as it occurs in individuals and as it is manifested in their institutions. It is, therefore, a social activity—an activity of persons, and in some cases, of highly specialized social organizations, that is, research agencies.

Planning is the guidance of a dynamic system, which might be a person or a social institution, on the basis of its *actual* behaviour, *not* its predicted or expected behaviour.

It should be easier now to grasp the complexities of this topic. We wish to guide, by use of information about its present behaviour, the scientific study of the educational process, and this guidance requires its own kind of research. In fact, we cannot avoid some work at a high level of abstraction: in educational research we study education, but in planning educational research we must also study "studies of education", in order to guide them more realistically.

WHAT IS THE LOGICAL APPROACH?

Logic leaves something to be desired when applied here, but the theory of classes suggests some dangers immanent in the previous discussion. Logicians have made a distinction between classes that do and those that do not include themselves as members, and the former are a nuisance that it is best to avoid whenever possible (of course, they cannot always be avoided). In this case we will simply assume that a study of "studies" will not be governed by the same rules and actions as are found to govern any one of the "studies". We need not move to the next higher level of abstraction in order to attempt to be all inclusive, yet we are free to move to the lower class, in order to discuss any one of the "studies" whenever it seems helpful.

IS THERE A SCIENCE OF EDUCATION?

The position taken here is that the educational process is a natural phenomenon, with diverse manifestations, and that it can be studied using scientific methods. That is to say, educational research is possible. This, of course, is not very clear, for scholars have been debating on the nature of science for a long time without making much headway. We should avoid expending much energy in this debate, because it is time-consuming and because we need to give a great deal of time to actual data collected from students and teachers.

Then "education" can be a science in addition to being an art or a way of life. For example, the classroom teaching-learning process is one aspect of the educational process, and learning theorists have recently had some interesting things to say about it. As another example, educational sociologists have studied schools as individual social systems, and their interpretations have been helpful to educational administrators.

According to the traditional organization of academic curricula, researchers on the educational process will find that the approaches of several disciplines are helpful. The scientific part of education can make use of the work of psychologists, sociologists, anthropologists, and communication specialists, to name only a few. In brief, in order to develop a science of education we should, if possible, employ a multi-disciplinary approach. Perhaps education will eventually become an applied social science in the sense that medicine is an applied biological science.

But education is also a *service*, and it is here that influences that may be unscientific can and do enter the picture. Today the need to *improve* the educational process is often stronger than the need to *understand* it. But efforts at improvement of educational service are not necessarily unscientific, and scientific studies of the educational process are not necessarily impractical. The implication is that researchers and administrators will need to remain in close communication.

DOES THE SCIENCE OF EDUCATION HAVE A STRUCTURE?

The structural features of science emerge from two sources, the phenomena studied and the methods of observation that are employed. Perhaps we should here recall that the two sources are not discretely separable: one cannot observe electrons without changing them, however slightly, and the same is true of students or teachers. The "second-order effects" of educational research, that is, the effects that are due to the subjects' knowledge that they are observed, or that they are interacting with the researcher, will be discussed later.

One useful distinction in studying the educational process is therefore the *individual-institution* dimension, for example, the pupil-school dimension; a psychologist may study one end of this dimension while his colleague, who is a sociologist, studies the other; or an anthropologist may attempt in some way to study the entire subculture in which the dimension is embedded.

A second division of research, into *comparative* and *developmental* aspects, is also due to our observations of the educational process. Education takes place over a period of time, and a statistical model that allows for this fact will be discussed briefly later. Educational *change* is a topic of considerable importance, and were we to confine our efforts to the comparative method using data collected only at one point in time, we should be ignoring the dynamics of the educational process.

Two other aspects of modern educational research have a methodological and perhaps a strategic importance. The first concerns design, sampling, data collection techniques, etc., and the second (which is not independent of the first) the personnel who will do the work, including their recruitment and administration. The first of these requires further discussion in the next section, while more about the second will appear later. Both technical and personnel problems loom large in educational research.

CONTEMPORARY EDUCATIONAL RESEARCH ACTIVITIES

Because the supporting social sciences required in educational research still lack integration, and because the science of education is undeveloped, the definition of educational research in the first section of this paper is not very enlightening. Here we can confess our ignorance, but perhaps gather courage by reflecting on the activities of persons who conduct educational research. We should confront the problem, even if we cannot solve it, of what *is* and what is *not* worth calling "educational research" today.

Any pretension, however, that "educational research is what educational researchers do" will provide a definitive view-point can be dispensed with. This definition, while meeting the criterion of necessity, is insufficient; it has the same status as "intelligence is what intelligence tests measure", and either slogan fails to incorporate the means by which more effective operations can be distinguished from those that are less effectual.

One approach to understanding education is guided by *formal experimental design*, in which well defined educational conditions ("treatments") are varied systematically in order to measure their relative contributions ("effects") to educational development or growth ("yield"). An example would be the learning of a language, as measured by achievement tests, by students of different backgrounds and aptitude levels, under different teaching methods.

The so-called "status study", for example, a *survey* of existing aptitude in a language, is a trivial kind of formal design, mathematically, even though it may raise sampling problems that are far from trivial.

In the history of experimental design in the social sciences there has been a tendency to be over-confident, to ignore unsolved measurement problems (for example, errors in the observations, or unreliability), and to overlook large sources of uncontrolled variation. A survey of numerous studies concerning the relative efficiency of autocratic versus democratic classroom methods (Stern, 1963) showed that over several decades neither method excelled in producing better academic performance. Studies of demonstration versus laboratory methods in science have been similarly inconclusive. Possibly, large variations from one experimental group to another due to personality differences of students (or of teachers) have obscured real treatment effects; or perhaps any important differences in the effects were not discerned using only measures of academic achievement and of satisfaction with the courses.

At any rate, the history of formal design in educational research is not very heartening. The factorial design is a logical generalization of Mill's canon, which describes how causation may be attributed after "holding all variables constant except one". Applications of Mill's canon are generally impossible in social research, and even the much more complete and efficient factorial design, in which many quantities can vary, is difficult to apply, partly because of the absolute need for randomized assignment of cases (Campbell and Stanley, 1963).

One reason for continued alertness about formal designs is that they may require assumptions not encountered in the real social or educational world; for example, fortuitous "natural" groups are usually available for study in education, not groups in which students have been randomly assigned. (At the very least an assumption that the *groups* are a random sample would seem to be needed.) Probably the failure to construct appropriate models has retarded formal educational experimentation, for educational growth is a complex stochastic process. This is not the time to abandon formal design, for designs that are complex enough to do justice to educational processes can now be used with the aid of large computers.

A second kind of educational research activity is *unsystematic trial-and-error experimentation.* This includes both *action research* and administrative, *experimental decision-making*, the latter including "operations research". This kind of experimentation, which is highly empirical, usually consists of operations in which the goals of the research, or the means for reaching the goals, or else both, are variable during the course of the research effort. Action research requires relatively continuous social interaction, for example, as in "workshops" for improving educational practices; the research itself is a task-oriented, or pragmatic, learning process, and the greatest difficulty lies in *evaluating* what has been achieved by the entire operation. Formal design users often contend that action research is mostly training, because it consists largely of second-order effects (see below), and it utilizes few data that are reliable. One colleague has pointed out, credibly it seems, that his own "non-action" research is not intended to be useless!

Experimental decision-making by administrators has actually to be experimental, that is, it must involve a suspension of judgment, in order to qualify as educational research. Moreover, such decisions must be based upon available data. For example, an administrator may decide on the basis of principals' judgments that his practice teaching programme is not achieving its goals, and, using additional information from practice teachers and their supervisors, he may decide to modify it. But unless the modification is made with the attitude, "Let's try it and see if it really is better—perhaps we will then need to try something else", that is, with a genuinely experimental attitude, the changes do not qualify as educational research. A presupposition here, of course, is that there is some valid performance criterion, or criteria, for teaching.

The existence of evaluative criteria is also the minimum essential in "operations research". In a manufacturing concern the quality of the product can more easily be measured than in the case of educational institutions. But this is not to say that criteria for evaluating performance, or behaviour, of a school's graduates or failures do not exist. One can always count diplomas or degrees sought or gained later by the students, when comparing schools, for example, or obtain other measures of productivity (which may or may not be adjusted for initial level at "input"). In such cases, the suspicion will remain that something less than the effects of education has been measured, a suspicion well justified by evidence that performance requiring well defined specific skills is more predictable than that requiring more general professional competence. Where any quality criteria exist the logic of operations research is applicable, but it has not yet been put to work to any extent in schools except intuitively, perhaps, and this moves it back into the domain of administrative decision-making, which may or may not be based upon reliable data and discretely defined operations.

In brief, then, the best unsystematic experimentation is that which can be made more systematic. That is to say, we are only now at a point where new formal models, all of which will be based on time series data, will be adequate to do the job. Moreover, it should be kept in mind that unsystematic experimentation may have an important side effect, which is sometimes of very great value in educational development. This is discussed in the next section.

Before proceeding to second-order effects, however, a word needs to be said about educational research that is used in conjunction with long range planning, or *developmental research.* "Planning" was defined as the guidance of a system on the basis of its *actual* behaviour, and it cannot therefore be carried out without the feedback of data into the system. Data consist of information about actual system performance, plus random effects ("noise"), and an educational system should be able to process educational data periodically in order to perceive and to decide what it is doing and where it is going. An educational system therefore requires educational research in order to guide itself—otherwise it will remain a static, passive system, possibly affected only by outside forces. Of course, as noted earlier, educational processes naturally emerge from the general needs of people, but these processes have traditionally been more passive than they will be in the future.

Educational processes will be more active processes and will therefore require more active guidance in the future because the world and India have entered into a new phase of development, for better or for ill. Within a few decades curves representing individual physical mobility, population level and available energy have become steeply vertical asymptotically—a crisis of unpredictability which is the worst kind (especially for social scientists) may be near at hand. Under these conditions what is the responsibility of educational research in its future activities?

It is the author's bias that the most responsible research in the future will focus directly upon social communication problems. Communication is the central domain of the teacher and the educator. Moreover, communication is the central feature of any social research, because data are, in part, messages requiring communication theory of one kind or another for their processing. There is much hope for new kinds of educational and social development based upon applications of communication theory, for in this theory it is not the *quantity* of energy that is important for effecting changes so much as its *quality* and *timing*. Communication processes, which in themselves require relatively small amounts of energy, hold together social institutions. Information can have an immediate and powerful effect upon the members of such institutions—upon their morale, their readiness to change and their motivation to strive toward common goals. The educational system, plus mass media networks, are the "nervous system" of any society, and improvements in these are worth almost any price. Even technological growth can be achieved in more than one way, in new ways that cannot be discovered without improved communication. More will be said about this in the recommendations for future research.

SECOND-ORDER EFFECTS

Practically all social research must contend with effects that have been produced *by the process of making the observations.* Corresponding to the "Heisenberg effect" in physics there are the "Hawthorne effect" and the "placebo effect" in psychology and in psychopharmacology, respectively.

Unfortunately much recent educational research has pursued one of two courses in treating these "second-order" effects: either the effect upon the subject's performance, of his knowledge that he is a participant, has been totally ignored; or else it is contended that this effect is the most important in the experiment, so important that the other effects may be entirely disregarded. For example, the really radical action research advocate might think: "We may not know *what* we are doing, but we are *all participating* for the common good!" Needless to say this is not what Kurt Lewin had in mind when he coined the phrase "action research". Again, "group dynamics" has been studied by "rock-bottom empiricist" clinical psychologists (including the writer, incidentally), who did not find it necessary to do any more than sit around waiting for "group goals" or some "inter-personal" communication of personal problems to emerge.

A third variety of group work involves a feverish pursuit of educational goals, for example, improved teaching practices, which because they are activities in relationship with school children can never be realized in a workshop, which in fact contains no children. The feverish pursuit of non-existent group goals may be only slightly less anxiety-producing or perhaps boring than the pursuit of mental health in a group-therapy session when the "patients" are really not patients, but are, say, graduate students pretending that they might be patients. Of course, a few *do* become mental patients, just as a few teachers *may* transfer what they have learned in their workshops to the classrooms in which, presumably, they carry out their really important work. More often than not, however, it seems that the headmaster and the other teachers were not sufficiently impressed with the workshop (which was in fact too remote from their own immediate concerns) to encourage the aspiring innovator.

So in these cases that have been described, action research is neither "action" nor "research" but instead a kind of fantasy that ought to be discouraged. The real point here is that action research *must* take place in the real world, and that if children who need to learn cannot do some of that learning in a workshop that was designed originally for the purpose of enhancing their learning, then the workshop had best concern itself with the problems that *are* there, namely, the teachers and *their* immediate problems. In case this recommendation is taken seriously and experimental effects again become important along with participation effects, then there are statistical methods for the isolation or separation of the two effects, both of which for educators should be measurable and due to learning.

It is not only that there is nothing wrong with second-order or participation effects, but that they probably ought to be developed much more intensively throughout the Indian schools. There should be more workshops focussed *inside* schools and on the learning process that takes place *inside* the students who attend the schools. This is probably the quickest way to focus upon solving some real educational problems: why, for example, some rural school students fail in examinations might quickly be traced to their teachers, their families, their poverty, their motivation, etc.

Second-order effects in educational experimentation are nearly always relevant when motivation is a variable of interest. Participation implies communication, of course, and experiences such as social approval and social disapproval. It is already known that *social* rewards for learning, for example, having a star placed after one's name on a bulletin board, enhance future academic motivation.

Educational research personnel also require incentives to do their work, and this might be achieved not only by respecting their career plans, but by keeping them in closer communication with their supervisors. For educational research is *social* research, not only because it concerns itself with social processes but because it *is* a social process. Therefore, participation motivation must be maintained for educational researchers: they must communicate with and help each other, and in respect to second-order effects their performance is probably no different from that of any other persons who happen to have enquiring minds.

MEASURING THE EDUCATIONAL PROCESS

Broadly conceived, "measurement" is simply an activity in which observations are systematically performed, according to some criterion of consistency (see below), and recorded. Although mathematics is logical, measurement operations, being activities, are not. Measurement operations are analogical, but it is clear that progress in the scientific disciplines has depended heavily upon them. Progress in science has not been possible without measurement, apparently because science is largely based upon *comparisons* that are needed to support interpretations or explanations.

For example, educational planners require information (abstracted from observations) in order to compare conditions from one locality to another and from one point in time to the next, for the purpose of making predictive statements about the educational system. And educational researchers compare different students at the same time, the same students at different times and the changes observed in different students; they also compare schools or educational systems, using analogous contrasts. Without objective measurement methods, having known margins of error, comparisons are impossible, and scientific work becomes guesswork.

The processes of measurement are not fundamentally different in social science than in other sciences, yet there is a difficulty that assumes peculiar importance in social (or psychological)measurement, which is that it is relatively imprecise.

Now "second-order" effects, for example, the participation effects discussed earlier, should *not* be treated as due to errors of measurement, when in fact they are due to real causes that are important in their own right, and when they can usually be isolated, for separate measurement, by using the appropriate designs. But even after removal of second-order effects the observed measurement values in social science nearly always contain a substantial error component which, if it is a random error component, can be assessed by replications. In practice, random sources of imprecision may be sufficiently controlled for testing hypotheses about groups, or may even be reduced to the point where probability statements about individuals can be made with confidence. But, in general, it may not be as easy as it sounds, because repeated measurements on changing systems (which are either persons or institutions) may fail to be experimentally independent. And if this happens a more general measurement model may be required, one that does some justice to the fact that in any individual educational change is, in this simplest form, *a complex non-stationary stochastic process.* Although this kind of process is not well understood there has been a productive attack made upon it. And briefly translated, the process is one containing many sources of variation, in which the various parts are not independent over time, and in which the laws of probability may vary, perhaps discontinuously, over a relatively long period of time.

But much social measurement does exist in which, for practical purposes, the trials may be regarded as experimentally independent. The distinction here between experimental and mathematical independence is important: measurement trials are experimentally independent if, and only if, the experiment does not force correlation or similar relationships among them. For example, there can be zero serial correlations for item scores within persons on a test, yet the other scores associated with any pair of items (a pair of "item counts") may be correlated. But this kind of dependence among items is not *forced* by the design.[2] Instead, it is an experimental finding in the sense that if the items were assigned *random* scores, the correlations would vanish (or would fluctuate randomly about zero). Unfortunately, this proof, using random data, does not yet apply generally.

In the basic psychometric model, tests of significance show that *for data from a single mental testing occasion* the stochastic assumptions are usually unnecessary. (In learning experiments, on the contrary, the order effect is of central importance)

Measurement of the educational process is likely to run into some awkward difficulties, but the problems must (and can) be solved But a second problem is what part of this complex process to study first, for example, the individual students, teachers, etc., or some other features of the school or school system. Now it is a fact that the early gas laws could be formulated on knowledge of pressure, temperature and volume without knowing anything about the molecules producing these microscopic characteristics, and perhaps social laws might be formulated in the same general way (Webster, 1951) without paying attention to individuals. This might re-orient our approach to individuals. But several points can be made here, the first of which is surely that we really do not know how to study institutions closely without communicating with at least some of the people whose activities define the (present) institutions. In fact, institutional analysts are likely to collect sample data from faculty and students, or else to interview "key informants" in studies of, say, schools; and they would be reluctant to depend only upon historical or demographic features of a school in order to describe it in a generally acceptable way today.

Secondly, studies of individuals *first*, before their institutions, has considerable sanction traditionally, for often the type of institution and how it functions has been inferred from summations (perhaps for numerous variables) over the members whose present behaviour is believed to be the most salient or most important aspect of the institution. At any rate, this method, the possibilities of which have by no means been exhausted (despite its common sense appeal), is more promising today because of the availability of large computers. In order to use the method we need not contend that other approaches are not also useful, but as in so many instances in India now, there is this urgent need to determine the relative importance of various approaches. Clearly there are not the resources to attempt everything at once, and the method selected initially might be quite critical here.

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[2] Item analysis and selection may indeed have "forced" the correlation, but this does not impose any *experimental* restriction upon a new sample of persons, who are not constrained in this sense to "agree" with the sample used for item selection.

It seems, therefore, that the method that measures the characteristics of school personnel (students, teachers, administrators, etc.) in order to use these characteristics in describing the school, as it is presently functioning, has definite advantages. Implicitly this kind of approach also contends that the student is worth individual attention, and this is desirable in democratic societies today.

Just as we can move from the study of individuals to their mean scores in *subcultures*, for example, the schools or school systems, so we can also take repeated observations on the same persons and institutions over time. We can compare individuals, or an individual with a subcultural norm, or the mean scores of groups (for example, the means of entering students at school *A* with those at school *B*) at a particular point in time. But we can also repeat these various comparisons for the same subjects at a later time, in which case we have incorporated the "longitudinal" method with the comparative one. Longitudinal data are not to be confused with age-group or with other non-cohort data obtained on different occasions from *different* persons. Non-cohort observations over time may have some utility, but they are a poor substitute for actual longitudinal data.

In measuring educational change we may need to make several kinds of comparisons. For example, we may wish to compare the *jth* student's difference score $(X_{bj} - X_{aj})$, obtained from pre-test *a* and post-test *b*, with *zero*, to decide whether it is large enough to be a non-chance effect, perhaps due to a particular educational experience. Or else we may choose to compare it with the *mean change* in his institution, in which case it is the quantity $(X_{bj} - X_{aj}) - (\bar{X}_b - \bar{X}_a)$ that is divided by its standard error in order to obtain the desired test ratio. In this case we are interested in the student's change relative to the changes in X that have occurred among his peers.

The extension of growth measures to differently weighted pre-test and post-test scores in order, for example, to make some adjustment for variations in the persons' initial scores, raises special problems in the case of mental test or other social science data. Since the observations are attenuated by relatively large chance variations ("error" components), it is not always clear how the traditional statistical models should be modified in order to avoid ambiguities (Kendall and

Stuart, 1961). The idea of equating initial scores in order to make gains in educational achievement more justly comparable (and more easily detectable) seems reasonable, but the traditional regression schemes for achieving this, for example, "analysis of covariance", treat only a small sub-class of functions that might be applicable.

This uneasy state of affairs is further complicated by other difficulties in defining or conceptualizing growth or change. Often it is not realized that there is no unique function to fit all conceptualizations of growth, least of all a linear difference score. Whatever difference function may be selected, however, if it correlates positively with the persons' initial true scores the growth so represented may be described as *cumulative,* for in this case the more of the measured entity initially, the more likely the person will be to gain on it more than others. If the correlation is negative, the smaller the quantity initially the more it will be likely to increase, and the growth is therefore *compensatory*. The phenomena of educational development comprise a "spectrum" of characteristics for which growth is cumulative, compensatory, or possibly (in rare cases) unrelated to initial level, when the latter is defined at various periods in life.

A natural extension of the estimation of growth, or change, from the data of two occasions is to use observations from more than two. Longitudinal data over a sequence of occasions are correlated, and the educational growth models of the future should be able to represent complex stochastic processes containing both individual and institutional parameters. As we have seen, developmental models for individuals can easily be extended to institutions, or to institutional subcultures, through use of the observations on the persons whose activities define the institutions.

The more difficult problem, in terms of the statistical questions that arise, is a fully general reapplication of the comparative method to longitudinal data. Educational administrators or inspectors reasonably enquire whether some educational effect of school *A* is significantly greater than that of school *B*, and in order to answer this question confidently it is now possible to compare mean *changes* in students attending the two schools. The intrinsically large random errors in social science data are less serious if contrasts among individual students are not required, and if a comparison of two groups of students is all that is desired in order to test a particular hypothesis. As already noted, however, the possibility of making reasonable allowances for the initial observed differences between students attending schools *A* and *B* has remained largely unstudied, and the comparison of several institutions simultaneously on more than one variable will require a general approach permitting large random error components in all or nearly all observations.

Finally, it has been recognized that most educational research projects entail simultaneous sampling in more than one domain. For example, a mental test containing k items provides data for a sample of n persons and for a sample of k measurement trials each time it is administered. As another example, a reading study will require samples of reading materials administered to samples of students. Some problems of inference that arise in this kind of double sampling ("matrix sampling") have recently been solved both in the United States and in India (Srivastava and Webster, 1964). Nearly all tests of significance previously developed for single sample problems must be modified for use with educational data obtained by simultaneous double sampling, including tests of significance of educational growth.

In this section two aspects of modern educational research have been discussed, the essential emphasis being on both the student and his institutions, and, at greater length, the measurement of educational changes. The need for improved methods of measurement in any social science becomes glaringly obvious whenever it is necessary to measure change. Therefore another kind of productive educational research today consists in efforts to improve these measurement techniques and analyses, particularly for longitudinal observations that reflect educational growth or achievement.

THE ADMINISTRATION OF EDUCATIONAL RESEARCH

We have already noted that educational research can be described according to phenomena emphasized (students or institutions), kinds of comparisons required (comparative or developmental), and strategy of approach (design used and methodological point of attack). A fourth distinction, discussed in this section, refers to the roles required of educational research personnel.

Educational research is an activity carried out by persons concerning the development of other persons and their institutions. As noted earlier, it therefore tends to become a complex social process in its own right. The problems of of the research sometimes are viewed either as administrative and organizational, or else as technical, psychological, sociological, statistical and so on. The administrative attitude is often service-oriented, and it may focus primarily on improving rather than on understanding education. It has been noted that these two aims need not be incompatible. The administrator will find, however, that they must in fact be actively integrated in some way if much is to be achieved. Social or educational research should be coordinated so that, if possible, it is not greatly endangered by social pressures or political changes. The interests of research personnel must be respected. At the same time, a major responsibility of the administrator will be to respond to the needs of other persons who are concerned about education, especially those who have been delegated public leadership roles. It is neither possible nor desirable to keep the public voice out of educational research.

The research administrator is therefore in a critical position in which he must be able to communicate knowledgeably with his own staff about technical problems, and at the same time with laymen who take a responsible interest in the research aims. This clearly requires a high degree of training, and considerable ability in communication and coordination.

Research on administrative processes has not been very helpful in discovering general principles that might simplify the tasks of leaders. There are, however, some discernible trends (Charters, *et al.*, 1965). The case study presentation applied to educational institutions seems to have been useful for educational (and educational research) administration, and evolving out of such discussions is usually some commitment to improve communication as a method of problem solving. Human motivation and human relations problems loom large. Administrators very often learn about the importance of communication (or of its lack) only through on-the-job experiences. If administration ever becomes a science, perhaps it will do so within the framework of communication theory, somewhat in the way that operations research has already been of service to industrial managers in their planning and decision-making. During periods of rapid social change, however, there is no easy method of making decisions, and some risk-taking is inevitable on the part of the more imaginative administrators.

In social and educational research in the West there has been a rapid increase in the number of large research centres affiliated with colleges and universities. The director of such a centre must invariably persuade faculty and administration that his research function is legitimate, and that it is consonant with more general educational goals. At the same time he may have difficulty in recruiting and retaining able research staff, because ordinarily such a centre must depend upon short-term outside support for its financing. Because research programmes of significance for modern education cannot be implemented without the facilities of one or more large centres, such organizations will continue to flourish, regardless of various transitional difficulties.

In the context of rapid change and planning, a research administrator always runs some risks of overlooking or minimizing his greatest asset, namely, his own research personnel. Few research persons are competent to grasp the complexities of the problems of education in the modern world and at the same time be driven to expend their remaining energy on creative, or even novel, solutions to problems, some of which are certain to be failures. A research organization rarely if ever produces anything cooperatively that will exceed in value the production of an unusually competent and imaginative individual. Multi-disciplinary work is therefore likely to be more productive when it is focussed on common problems for which there is at least a common universe of discourse, rather than upon entirely new or unique kinds of activities. It is often useful to have an explicit policy of how the individual's time is to be divided between the multi-disciplinary and the more individualistic or unique contributions. These kinds of commitments should be worked out in the early phases of particular projects. But communication among the various specialists continues to be important throughout any multi-disciplinary effort.

SOME GENERAL RECOMMENDATIONS FOR FUTURE EDUCATIONAL RESEARCH

Too little systematic knowledge has been developed to enable us to make statements about the future course of educational research that are *general* and that, at the same time, will have much immediate utility. General statements are useful, to be sure, but only for special purposes. It is easier to make specific statements and recommendations, but this entails another difficulty: it is more difficult to achieve agreement on specific recommendations.

Research efforts ordinarily have more uncertainty and more unknown outcomes inherent in them than most other kinds of activities. (One aim of research, by definition, is new knowledge.) Therefore research that is not guided by some theory, either implicitly or explicitly, is likely to be wasteful of time and effort. Theory is needed, and preferably explicit theory, because it makes possible careful decisions that some research operations are preferable to others. In a field as broad, complex, and time-consuming as educational research, the choice of operations can be critical.

But it is not enough simply to say that theory is essential, and that it ought to be written down and studied in the planning of projects, for theories vary from the kind that are specific, concrete, and powerful to those that are general, abstract and weak. The strong theory generates verifiable propositions in a narrow domain; the weak theory generates few if any non-trivial propositions that can be treated empirically. And this dimension for kinds of theories is important because in social science it has not yet been possible to write general theories subsuming very powerful smaller ones.

Which kind of theory then will be most helpful in educational research? This depends entirely upon the use intended for the theory. If consensus about general aims of research is needed, or a common language is sought about educational problems as seen by a multi-disciplinary team, then a general, abstract theory *with which few can disagree* may be helpful. On the other hand such a theory may be so "empty" that it is almost useless in selecting specific research operations. After it has achieved its unifying effect, which is often more a matter of morale than anything else, more specific theories, about which there can and should be some disagreement, will also need to be considered.

Are there any other general theoretical considerations that should guide educational research? One may be that because education is a world problem, not confined to one nation or continent, educational research should follow international, or perhaps supranational, principles: human growth and human needs present similar problems everywhere, even though the conditions of life may vary from one culture to another. Another aspect is that educational research will fail if it is dominated by *a priori* ideologies, either concerning the nature of human development, or the ways in which it should be studied. For example, nature-nurture controversies, and arguments about quantitative versus qualitative features of educational growth are simply unnecessary : what is needed is the study of data followed by improved theory. Doctrinal views expressed as radical environmentalism, say, or as positivism, or behaviourism, or psychoanalytic dogma have no place in the part of education that can be scientific. This is not to say, of course, that imaginative use of data within any particular theoretical framework cannot be useful.

Finally, we must remain fully aware of the present unsatisfactory state of social science, including its mathematical models, if it is to be pressed into service as an aid to understanding the educational process. The only theory that has been accepted as useful by nearly all scientists today is the *theory of data processing* or *information and communication* theory, and it is both so general and so undeveloped that there is not much in it with which anyone can disagree entirely without entirely discarding scientific method. This theory, therefore, deserves more intensive development and study.

Specific recommendations are discussed in the next section. Some general recommendations follow :

1. There should be more educational research, and the results should be disseminated more widely and more rapidly.

2. It should focus upon educational changes and development in students and in their institutions, and it should not be limited by ideological fixations.
3. It should be carried out through the coordinated efforts of educators, social scientists, mathematicians, and data processing experts throughout the world.
4. For optimum usefulness, educational research should focus upon the integration and coordination of educational *activities* by means of improved communication methods, both among educational institutions, and between them and the subcultures of the nation and the world. This may entail action research, experimental decision-making, and, possibly, new and more realistic formal experimental designs.
5. The theory of data processing, or general communication theory, should be developed to meet the needs of educational and social research.

The purpose of these recommendations is to provide a general orientation, before considering the more difficult problem of formulating specific recommendations.

THE PROBLEM OF SPECIFIC RECOMMENDATIONS

The most important problem confronting educational planners in any complex and changing nation such as India is probably the priorities problem. This is also true, but not quite to the same extent, for educational research. The priorities problem is important whenever research is intended to guide development, for in this case research serves as a perceptive organ that feeds back information about the educational system's performance; and to the extent that the system is harassed by the priorities problem, so is educational research. Research conducted for other reasons or motives would be free from this constraint. Possibly this gives to research an essential quality, which is freedom; for it is very doubtful that it can be demonstrated that most human behaviour is purposeful or goal-directed, which is of course true of educational planning.

Therefore, one solution to the problem of specific recommendations might simply be not to make any recommendations, except perhaps to insist that every research person follow his own whims, or his own curiosity. But, in any scientific endeavour, the condition of total freedom is an illusion: science is, among other

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things, a *discipline.* It is a discipline because it is constrained by the characteristics of the phenomena studied, and by the methods for making the observations. For this reason, even though creativity and freedom are highly desirable in a scientific approach to the educational process, some things are better studied at certain times than others. Hence we cannot really avoid the priorities problem, even in research that is presumably not intended for planning educational development.

In confronting the priorities problem we need to think of the manifestations, or the phenomena, of the educational process, and of the methods for observing it. This is not an easy task, for it confounds thought with activity or method; but it is the usual task that confronts the scientist, and, in this sense, research requires both theory and strategy (whether or not we assume, pragmatically, that they are indistinguishable).

A topical outline may help in thinking about the kinds of educational research activities or potential projects :

POTENTIAL RESEARCH PROJECTS

I. STRATEGY PROJECTS

A. Resources

1. Manpower trained for social research
2. Organization of educational research: agencies, information networks, training facilities.

B. Models

1. General communication theory
2. Specialized communication theory
    (*a*) Measurement models
    (*b*) Decision models
    (*c*) Implementation models
        (i) Social change
        (ii) Discrete problems: curricula, evaluation, inspection and supervision.

C. Operations

1. Data collection problems
2. Data processing problems
3. Information storage, retrieval, and dissemination.

II. SYSTEMS PROJECTS

A. Individual students

B. Students in subcultures

1. Demographic and social
2. Academic and ideological
3. Talented, or gifted.

C. Student change

1. Social impact, "modernization"
2. Academic achievement
3. Types of increasing independence, impulse expression, and responsibility.

D. Teachers

1. Recruitment, training, professionalization
2. Motives and practices.

E. Schools

1. Demography
2. Programmes
3. Subcultures: students, staff, administration
4. Community interactions (including other agencies).

F. Colleges

1. Subcultures
2. Research activities
3. Teacher-training functions.

G. Consultants

1. Political, national, and state leaders
2. Technical (including communication) specialists.

There is only one highly critical priority, in the view of the present writer, and that is trained manpower. Persons who can be highly productive in educational research are those who have had experience and training in performing educational research.

I-A. Surveys of educational research resources

There should be a continuous survey of educational research activities and research personnel will be quick to realize the utility for their own needs, of such a cooperative enterprise. Key informants are *state* and *national education officials*, and *project principal investigators.*

In this survey there could be included work (*a*) completed, (*b*) in progress, and (*c*) planned; and (*d*) abstracts of types of stored data, retrievable for use by colleagues, and (*e*) conclusions and interpretations based on analyses of data.

But in social science, projects are not entirely distinguishable from social scientists. Second-order effects necessarily play a part in the interpretation of data. For this reason and for the purpose of encouraging future projects, the activities and characteristics of research personnel themselves should also be studied; their beliefs, motives and incentives for work are of great importance for the success of future endeavours.

At the beginning of this project, its collaborative orientation should be emphasized—participants should know that results will be reported to them as the survey proceeds.

I-B. Development of theory and models for educational research

Communication theories and strategies should be investigated jointly by educators, social scientists and mathematicians. These range over a wide domain that has yet to be unified.

For example, the statistical theory of communication treats the stochastic processes referred to earlier; but beyond that the "trees" that are so often drawn to present social organizations are really not complete, but topologically should be "circuits", because there must be information feedback within the organization (and with the outside world). These systems can now be described by non-linear mathematical models. Their communication states can even be described by boolean algebra or some variant thereof.

Control systems for *social* organizations are *not* beyond the purview of modern analysis, even though they are what a physicist would describe as open (non-conservative) systems. It is true that when a social system controls itself in relation to its environment there may be at times a great many degrees of freedom, such that a state of lawlessness may even seem to prevail. Nevertheless, we should not avoid the problem of creating models for it. For in many respects, a school, for example, *is* an organism that has continuous interchanges with its environment, that has a renewable life cycle, and that is dependent for its survival upon administrative decisions. Decision theory is incomplete, of course, just as the other theory that can do justice to the complexities of social organizations and their functioning also needs development.

Why is it that these various aspects of general communication theory—for example, self-control, stochastic growth, decision points (or spaces)—have not been brought to bear in a unified way upon the problems of social organization and administration? We might conjecture that in fact men fear this or agree with Freud that the most important decisions of life are intuitively or even unconsciously made; perhaps there is (unconscious) resistance here. But even if this is true, rather *especially* if it is true, we need to focus exactly upon this kind of social science. It is not sufficient to dismiss communication theory because, say, it cannot yet fully explain the semantics of human communication or because it still lacks completeness—we should improve this theory in any way that we can, and by any amount of collaboration among numerous kinds of communication specialists. Educational and mass media systems are the communication and control organs of society, and there should be formal as well as the usual plethora of informal attacks made upon the problems of using information strategically in order to optimize decisions at various levels within society. We should not fear mechanization or "dehumanizing" influences, at least until it is demonstrated that we cannot put into the equations at the individual's level, measures of his own motives, values and aspirations. (It would be farcical to proceed otherwise.) Man *can* control his technology, provided he attempts first to understand himself and his technology fully. This we are not doing at present. We are not confronting the real problems that exist in the modern world, and we are not confronting the communication problems with the courage of earlier leaders.

In addition to general communication theory development, there are many special aspects of it that should also receive renewed attention, including social measurement, as discussed earlier. Observation (or measurement), decision and implementation each requires theoretical re-formulation based upon continuous practice and experimentation.

I-B-2-c. Implementation of specific changes

It is commonly said that India is long on planning, but short on implementation. She is probably changing under duress of various national crises very much faster than we think. Perhaps it is the difficulty of predicting the form that the change will take that makes planners anxious. At any rate, a project that would study how earlier recommendations concerning desired reforms in curricula, examinations and inspection of schools have failed to be carried out might be valuable. It might be valuable for the same reason that a person with an uncertain future reviews his past, namely, in order to better understand the present.

There has been an unwillingness in some quarters to face up to the fact that no specific reforms of any depth can be made without significantly altering the entire social fabric. For example, in the case of examination reform it is actually the teachers who set, administer, and read the examinations; in addition, they tutor some few students to help them achieve passes. It would therefore be foolish to attempt examination reform without studying the vested interest that the teaching profession and its chosen students now have in the present system. Indian culture functions as a whole, and one part of it cannot be altered without affecting the rest.

I-C. Research on research operations

This topic is probably too low in priority to merit separate consideration in a brief monograph. Perhaps the usual practice of incorporating it into studies that are focussed on substance rather than method is sufficient at this time in India.

II-A-B-C. Studies of students as individuals and as members of subcultures

A series of interrelated projects should be focussed upon the characteristics of school and college students, as persons in diverse subcultures who are experiencing rapid growth or change.

A few years are a long time in the lives of students, compared with the same period for their parents and grandparents. While old men make *plans* for social change, youngsters bring it about. In a sense young persons *are* the future, and they are very important.

Most of the Systems Projects offer very worthwhile challenges to the educational researcher, partly because of the inter-dependencies among the persons and institutions listed in the second half of the topical outline. It is not merely difficult to study individuals independently of their institutions—in practice, it is impossible. Nevertheless, a case history of a student chosen at random might at first be placed in category II-A.

The utility of case histories of individuals in the field of educational research is limited but very important. Under the existing conditions, the value of case histories is enhanced when they comprise a smaller random sub-sample of a larger group or sample, all of whom have provided other kinds of data. From case histories alone it is difficult to make generalizations about educational development, but vague or inexplicable findings obtained from lengthy test, questionnaire, and interview-rating data become more meaningful when studied in conjunction with case histories or autobiographies.

The case history method remains the supreme challenge to the psychologist who wants to understand student behaviour within its legitimate developmental context. It remains an extremely difficult method, for which much training and experience are required, and it stubbornly refuses to yield any enduring generalities. It is the most powerful of all methods for obtaining new knowledge; but perhaps in deference to the uniqueness of the individual, it is the weakest source of generalizations about educational performance or behaviour. The psychoanalysts are the most adept at using this method, and perhaps the least interested in the typical educational policies and practices.

We are in fact on the threshold of entirely new methods of analysing a great many observations obtained from one individual, and experiments using large-capacity computers for this purpose are well under way. Naturally, an intensive study of one person over time can be extended to many persons, and there is little doubt that developmental psychology will profit from these new experimental analytical methods. The educational process will be a part of the general changes observed, and, in particular, the guidance movement within education may be advanced considerably by this intensive approach. For some time in educational research, however, such ambitious ventures will probably have to be left to single-minded, entrepreneurial types of investigators. In any case, it seems too early to recommend methods such as these for new projects based on the use of case history data from many individuals. (Of course, the writer could be wrong about this.)

On the other hand, studies of students as members of a variety of subcultures are already proving useful in solving certain kinds of educational problems. Perhaps one example can help to clarify this idea. In some colleges in the United States *academic* subcultures have been identified—for example, groups of students designated as "liberal-intellectual", "vocational-professional", "humanitarian", "aesthetic-artistic", "applied science", to name a few. Colleges differ greatly on the distribution of students in the various categories. Some small institutions have only one predominant academic culture, while others may have three or more, sometimes in active competition, each with the others. For characterizing the academic or intellectual climate of a school, these kinds of distinctions can be very helpful. There are always some alienated or independent students who do not belong to any group, and there are subcultures in addition to those reflecting academic interests or activities. For example, about ten per cent of the students on most campuses in the United States utilize the mental health services of the college; another minority will be very active in political movements; and still others will have no discernible interests beyond simply obtaining a degree in order to earn more money after graduation. There are also distributions of students according to value patterns, sometimes characterized as "aesthetic", "religious", "social", and the like. These may or may not be closely related to social subcultures, distinguishable according to empirical friendship patterns. Subcultural groups are not difficult to identify, using multiple corroborative methods based upon consciously expressed needs and overt behavior, and they are among the more salient features of any school.

There should probably be initiated in India more studies of students, classified according to academic, social and other kinds of characteristics. This would entail collection of data through questionnaires, mental tests, interviews and related observations. Some important social group membership variables are listed under II-B, and the most important developmental syndromes appear in II-C.

The latter require, for careful study, longitudinal observations using specially developed instruments. In addition to measurable gains in academic achievement, other syndromes might be considered, for example, growth in independence (largely a psychological trait, in this case) and reaction to the forces of social change, here categorized as "modernization". Some of this research is already in progress in India, but more of it should probably be undertaken. The initial steps required for such studies entail reviews of earlier research plus a systematic and fairly broad programme for developing the special instruments needed.

Finally, some highly visible or conspicuous educational problems, such as student discontent and rioting, deserve a concerted attack. The very process of interviewing fomenters and followers in such reactions might do much, if conducted properly, to lessen tensions and to forestall future difficulties. Here the second-order effect might be the opening up of new channels of communication for students who have either genuine or perhaps imaginary causes for grievance. More constructive ways of permitting student reactions to frustration could evolve during the course of such research. There have been, of course, multiple causes suggested for some kinds of disruptions, including resentments over examination policies, anger about language laws, economic inequities, and low quality of instruction. If these are in fact confounded to any extent, then the nature of the mixture in various cases would provide an appropriate topic for educational research.

II-D-E. Projects aimed at understanding the teaching-learning process

These investigations could be of two kinds. The first would emphasize teacher characteristics, perhaps according to the topics under II-D in the outline. Also, some of the student characteristics research, mentioned in the preceding section, might be appropriate for subjects who are teachers.

The second type of research could be focussed on the nature of student-teacher interactions inside and outside of classrooms. One challenge here to design specialists is to bring out student-teacher interactions as specific factorial effects, and more than a two-factor design would surely be needed for this purpose.

II-E. Research on schools as social systems

Much of the previous discussion of projects oriented toward understanding students and teachers can be integrated within intensive studies of particular schools, and even to some degree in extensive research on numerous schools.

Some results from American educational research may be pertinent here. Sociologists studying the development (historically and dynamically) of colleges have concluded that probably the most important feature of one of these educational institutions, in terms of its actual future functioning, is the syndrome of personality traits characterizing *the entering students.*[3] Everything about an institution seems to be related to these student qualities. For example, faculty recruitment is affected, over the years, by these student properties, which are also perpetuated both in the older students within the college and in the public image of the college that is generated in the community. There is ordinarily a time-lag of a decade or so for significant change in the public image, which may vary considerably for several aspects of the school, including some that may attract the types of students who will join the next entering class. Therefore, the school is a dynamic social system with specifiable inputs and outputs, of students, faculty, and community representatives who become the administrators. Although the generality of these findings is open to question, the model itself is credible.

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[3] A wag remarked, on seeing this interpretation, that the educational sociologists had inadvertently rediscovered educational psychology, which had declined because of a widespread disinterest in entering students!

Perhaps this is an appropriate point at which to emph
study of education in institutional settings should not be restr
discipline, including of course the well established educati
successful revival of educational research in America is due
view-points of "outside" social science specialists (who, in s
admitted into schools of education in a mood of sheer despe
other single factor. It is not that the established specialties i
and are still not important; they are very important, and they
What is becoming increasingly obvious is that the growth in n
lexity of the educational enterprise requires a continuous s
Social scientists, who are brashly ignorant of most educati
likely source of ideas, most of which can be expected to f
almost any price to find the few new ideas that succeed.

In addition to the characteristics of the persons who in
school and its subcultures (including those of students and sta
and external administrative officers—see II-E-4), certain other
should be kept in mind. For example, "academic climate" is a
of considerable importance that could probably be rated re
and there are other judgments of pertinent characteristics that c
with schools to aid in our understanding of them, for example,
and some measures of the success of the graduates, perhaps
level. Certainly, one inference from the logic of inspection,
process itself, is to assess the "quality" of the school produ
initial quality of the "material" the school has had to conten
cussed earlier in this paper.

It is difficult to explain to laymen why this idea, which
technological, is in fact worthwhile. Whether the application
production methods" in education will have a dehumanizing e
depends entirely upon the meaning of the borrowed terms, "
duction". It seems worth repeating that it is quite possible t
tions of these terms some measures of the most important
sensitivities of man.

Education today is many things, some lofty and others
tical and mundane. Modern education requires many process
are very technological. We had best not ignore the technolo
they are more likely to have solutions than some of the oth
example, one simply cannot reasonably ignore the fact that

verbal scholastic aptitude scores of first-year students in a random sample of 200 colleges in America spanned a range of nearly four standard deviations on the distribution of *individual* scores! (Heist and Webster, 1960). Any discussion of "uniform" standards among colleges that does not take into account this incredible range of institutional and individual human differences in ability to understand the written word ignores a most important, though very technological, fact of life.

The tendency of modern education to diversify from within, in the interests of doing justice to the natural diversity of human beings, is its most striking developmental feature. But the processes of institutional diversification on a large scale can be understood and controlled only if certain kinds of technological methods are employed, so complex have the educational systems of large nations become.

One conclusion therefore is that the skills of various management and operations consultants should be combined with the knowledge of teaching scholars on an unprecedented scale, if educational systems are to survive as viable social institutions. And a corollary to this is that educational research must be expanded at several levels if we are to retain even the vaguest notion of what is really happening to our educational systems.

II-F. Universities and colleges as communication systems

The leadership required of large educational systems referred to in the previous section must be found somewhere. One of the obvious places to look for it is in the universities. A research project of some value for this purpose might start by collating the ideas and recommendations of college faculty members concerning the educational needs of the nation. A second study, that could be of more value to the universities, would obtain the perceptions by faculty of their own roles as communication specialists. Questions raised might include (these are only suggestions) :

How do faculty describe their responsibilities to their profession, their students, and the larger public ?

Should faculty seek political as well as academic roles?

Should faculty publish articles to be read by the general educated public?

not, why not? If so, what types of articles?)

What is the nature of the communication process between the other power groups—students, administration, public representatives—and faculty, collectively and individually ?

In what ways, if any, do faculty communicate with secondary school personnel, and is it two-way communication ?

What responsibilities (if any) should faculty assume for the improvement of the training of other communication persons such as teachers, communication engineers, journalists and politicians ?

What should be the research function of faculties, and how is it related to teaching graduate and undergraduate students ?

Can faculty or other groups do anything more to alleviate student discontent with present social conditions that tend to disrupt the functioning of universities and colleges ?

II-G. Studies of educational consultants and advisers

This research would be aimed at how various advisers perceive their own work, and at understanding their relationships to colleagues with whom they consult on educational problems.

A second phase of such research would consist of interviews with key informants on their ideas of how best to use the services of specialists, both national and foreign. A final phase might explore public images of different kinds of consultants.

THE PRIORITIES PROBLEMS

Perhaps the preceding section can serve as a stimulus for further ideas, and as we know, special recommendations in social research are not acceptable without considerable social thought and criticism. In other words, the coverage of topics cannot (in the very nature of things) have been comprehensive, in terms of India's needs, nor can the emphasis on some topics at the expense of others have been entirely appropriate.

Therefore we are again left with the priorities dilemma : Is there in fact an operation by which it can be decided what would be the more important kinds of research *for the nation first to invest in* or must this decision remain at an implicit level, or perhaps subject only to the whims of those research personnel who, however well-intentioned, happen also to have the kinds of personalities that enable them to secure funds with which to satisfy their own interests or impulses ?

The writer believes that educational research can become much more valuable for India than it has been in the past. If it is possible to define an educational system that has a national character, then it is surely also possible to bring educational research much more fully into use in order to clarify these national educational goals and to implement their attainment (Naik, 1965).

There is certainly a place for the research projects of the impractical dreamers, in any democracy; among them are some few who are the real innovators. But there is also a place for much more intensive collaboration than has heretofore been possible in determining which projects will eventually best meet the social and educational needs of this remarkable democracy.

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The Structure Approach to the Disciplines : A Review[1]

Professional educators and people interested in education need hardly be told that since the turn of the century the United States of America has been leading in educational thought and practice. We in India have imbibed much of that theory, and the jargon, and have also sought to bring about changes in educational practice on those lines, subject of course to the limitations imposed by our conditions and circumstances.

It is not so well known, however, that for some time past, there has been a great ferment in educational thinking in the U.S.A. This ferment has already partly affected, and is likely to affect even more in the future, the curriculum in school and college.

Even a cursory study of recent educational writing reveals that an increasingly large number of Americans are becoming critical of the education that is today imparted in their schools. The criticisms may broadly be summarized as four major ones :

1. The gifted child in the country is not receiving the attention he needs, and this may ultimately tell upon the efficiency of the nation.
2. The schools are not making the pupil put in that much of hard work which he is capable of, and their dominant aim, that of "socializing" the child, needs revision.
3. The hiatus between the knowledge imparted in the school and the latest developments at the scholarly level is growing; hence the urgent need for overhauling the content of the curriculum.

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[1] In this paper the author summarizes some basic statements on this new subject by certain thinkers and recognized leaders in American education. The intention is, primarily, to acquaint the educational worker in India with this new approach which promises to become a vital curriculum principle in the immediate future.

4. The subject disciplines, which know no national frontiers and will go on developing regardless of political changes, are not receiving adequate care in the education of the pupil at school.

The first criticism has started bearing fruit. It has pointed out the fallacy of the popular conception that any special treatment of the talented child negates the democratic principle of "equality of opportunity" (which, Lord Robbins once said, does not mean "equal assessment of unequal capacities"). Now, great emphasis is being laid in the U.S.A. on the special needs, and proper nurture, of the gifted pupil. This movement for the special care of the gifted has not stopped there but has gone a step further in demanding excellence in education, not for the gifted alone but also for the many.

The second criticism is voiced prominently in Conant's now famous reports on the American High School and the Junior High School,[2] which sparked off a heated debate in educational circles in the U.S.A.

The third and fourth criticisms have the most important curricular implications and will form the main theme of this article.

Knowledge is growing fast and today the rate of its growth is tremendous.[3] This by itself demonstrates the futility of an attempt to "cover" even one field of knowledge in an entire lifetime. The cognitive aim of the curriculum stands in need of revision and may now be stated as "a reasonably wide acquaintance with basic theories, principles and key ideas in the major branches of learning and the ability and the desire to read steadily and widely throughout life".[4]

[2] Conant, James Bryant. *The American High School Today*. New York: McGraw-Hill, 1959, and *Education in the Junior High School Years*. Princeton, N.J. : Educational Testing Service, 1960.

Compare also, Arthur E. Bestor. *Educational Wastelands*. Urbana, Ill.: University of Illinois Press, 1953; Rear Admiral Hyman G. Rickover. *American Education—A National Failure*. New York: E.P. Dutton Company, 1963; R.W. Heath, (Ed.) *New Curricula*. New York: Harper & Row, 1964, pp. 1-8.

[3] It has been estimated that if we plot the accumulation of knowledge on a historical continuum, beginning with the birth of Christ, the first doubling of knowledge occurs in 1750; the second in 1900; the third, 50 years later, in 1950; and the fourth only ten years after the third in 1960. (Ole Sand and Richard I. Miller. Perspective on National Studies in the Disciplines. *J. Sec. Edu.*, January 1963, 27-28.

[4] McGrath, Earl. J. The Meaning of Academic Excellence. In Henry Elhers and Gorden E. Lee, (Ed.) *Crucial Issues in Education*. New York: Holt, Rinehart & Winston, 3rd ed., 1964, p.292.

This brings us to our theme proper: How should the curriculum even at school look upon knowledge and the age-old "disciplines"? For an exposition of the new point of view, we turn to several thinkers.

Philip H. Phenix[5] states his thesis thus: "All curriculum content should be drawn from the disciplines, or, to put it another way, *only* knowledge contained in the disciplines is appropriate to the curriculum". To prove his point, he turns to the word "discipline", which stems from the Latin *discere*, to learn, and comes from "disciple".

> Etymologically, then, a discipline may be construed as knowledge, the special property of which is its appropriateness for teaching and its availability for learning A discipline is knowledge organized for instruction. Given this understanding of what a discipline is, it follows that all teaching should be disciplined, that it is undesirable to have any instruction in matters which fall beyond the disciplines. This means that psychological needs, social problems and any of a variety of patterns of material based on other than discipline content are not appropriate to the determination of what is taught—though obviously such non-disciplinary considerations are essential to decision about the *distribution* of discipline knowledge within the curriculum as a whole."

Phenix then points out the destructiveness that has followed a misconceived dualism between "the specialized logic of the disciplines" and the "largely unrelated psycho-logic of teaching and learning". This dualism, he says, will disappear once the essential meaning of the disciplines as a body of instructive knowledge is recovered. "So understood, the disciplines will be seen as the clue to good learning and teaching, and instructiveness will be seen as the mark of a good discipline."

That knowledge is superior which readily enlightens the reader's understanding. This superior knowledge has three fundamental features: (i) analytic simplification; (ii) synthetic coordination; and (iii) dynamism.

Analytic simplification consists in the ability to generalize from a mass of apparently unrelated experience, to discriminate between meaningful impressions and vague, casual ones and to abstract "that is to discern properties, qualities, or forms of things". But analysis is not an end in itself. The understanding being simplified, the road is now open for significant patterns and relationships to reveal themselves. Herein lies the pedagogical virtue of a discipline: "Whatever is taught within a discipline framework draws strength and interest from its membership within a family of ideas." Even that is not all. A discipline is also dynamic, for it leads on to further understandings. It "contains a lure to discovery" and "its ideas excite the imagination to further exploration".

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[5] Phenix, Philip H. The Disciplines as Curriculum Content. In A. Harry Passow, (Ed.) *Curriculum Crossroads*, New York: Bureau of Publications, Teachers College, Columbia University, 1962, pp. 57-65.

He concludes :

> I think it is the special province of people in the schools of education to see clearly the relationship between disciplined knowledge on the one hand and the tasks of teaching and learning on the other, and the interrelations between the fields of knowledge within the curriculum as a whole. In the light of these visions, educators can help the disciplines to be truer to their own essential nature and instruction to find once again its proper resource.

The author to whom we go next is Arthur W. Foshay, and two papers by him on this subject may be considered. In a short paper[6], Foshay tries to offer "a way around the dichotomy we have practised between a problem-centered approach to arrive at curriculum content—an approach in which leads to the choice of content are to be found primarily in the lives of the students or in the contemporary scene—and the older, subject-centered approach".

The "way around the dichotomy", according to him, lies in the structure approach to the disciplines.

> The structure of a discipline may be taken as highly suggestive of the way the discipline itself may be learned. Experiences can be arranged in school in such a way as to lead students to discover the principal concepts of which a discipline is made, and the ways these concepts relate to one another...In so doing, it offers the student a way of encompassing the new knowledge that is developing on all sides.

He goes on to specify three main elements in a discipline ;

1. A discipline has a domain—the phenomena or the aspects of life for which it takes responsibility.

2. It has methods or rules according to which the scholar in the discipline seeks out and handles the data given in the domain, and according to which the quality of the generalizations he reaches may be judged.

3. It has a history, or a tradition, which enters into the decision on both the domain and the rules according to which it proceeds as a field of learning.

Foshay then speaks of the significance of the disciplines in human life. That sophisticated knowledge which separates the educated from the uneducated comes precisely in these disciplines. "These are the forms in which human knowledge has been handed to us. We cannot revoke them, though, of course, those who are in these fields may modify and develop them."

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[6] Foshay, Arthur W. Discipline-centered Curriculum. In A. Harry Passow, (Ed.) *op. cit.*, pp. 66-71.

He further distinguishes this approach from the usual subject approach to the curriculum, which he has already criticized in the opening paragraphs of the paper. "The reason all this appeals to me is that with respect to the school subjects, as we have known them, this offers an intellectual liveliness that our tradition of the school subjects denies us...This idea is, it seems to me, a truly radical curriculum proposal."

He concludes: "We have to have it both ways—both problem-centered and discipline-centered, if you please—if we are to produce students who, at the same time they think, are fully aware of the intellectual processes that they themselves are using."

The other paper[7] Arthur Foshay opens with a brief historical survey of the sources of the curriculum as they have developed in the U.S.A. from time to time. So far, he says, the bases of the curriculum were principally two: the nature of the growing child and the nature of society. Developments in the area of child psychology have resulted in a change in the atmosphere of the schools, which are now more humane institutions. But, says he, these developments have not influenced the curriculum in a positive manner. "I call to your attention the fact that they do not tell us what to do—only what not to do."

The second basis—the nature of society—has brought about a curriculum, the major criterion of which is social utility. This has sought to turn schools into socially responsible institutions, but that has not solved the problems of American society. Juvenile delinquency, for example, appears to have increased greatly. The problem of national security and integrity is also assuming great magnitude. This happened because "the theory on which educators were behaving was flawed from the beginning by a failure to acknowledge a third element necessary for the making of intelligent curricular decisions", and this element, according to Foshay, is the nature of organized knowledge—the disciplines out of which man's knowledge is made.

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[7] Foshay, Arthur W. A Modest Proposal for the Improvement of Education. In *What are the Sources of the Curriculum? A Symposium.* Washington, D. C.: Association of Supervision and Curriculum Development: A Department of the National Education Association, 1962.

So he comes to his "modest proposal", which is that "we educators take directly into account the nature of the organized bodies of knowledge, in addition to the nature of the growing child and the nature of our society, as we try to make curriculum decisions". He clarifies his position by adding that he does not plead for the return of a "subject-centered curriculum": he only proposes that "we examine the subject-matter we teach with the same rigor, and with the same kinds of help, that we have used in examining the child and society".[8]

This brings us to the root of the theme. Subjects as disçiplines should now figure more prominently in the school curriculum, which is centred upon an "attempt to teach children to grasp the intellectual means through which knowledge is discovered, in the hope that they may thus become active, not passive, learners". What therefore is required of the curriculum-maker and the educator is that "the disciplines as known by producing scholars be translated into viable experiences in school".

Before we take leave of Foshay, we may note an important point he makes. He exhorts educators and curriculum-makers to remember that man is not only an intellectual creature and therefore "we have to learn to ask of the scholars exactly in what way each of their disciplines contributed to the wholeness of the whole man".

Bruner's *The Process of Education*[9], which is the basic book on the subject, is the Chairman's Report on a conference held at Woods Hole, Cape Cod, where about 35 scientists, scholars and educators gathered to discuss how education in science might be improved in primary and secondary schools. The conference was unique in its composition in that not only Bruner, a psychologist, was its chairman but also that the participants included psychologists from different schools of thought, historians, scientists, professional educators and experts

[8] This plea of his is strengthened by the fact that American scholars and educators have for some time past been striving hard to attain the objective of changing the nature of the basic conception of academic subject-matter. Groups are today working on this, not only in the U.S.A., but also in the United Kingdom and France. The subjects that are being chiefly re-examined are of course mathematics and the sciences, but economics, geography and social studies, too, are engaging the attention of national committees in the U.S.A.

Reference may be made to R.W. Heath, *op. cit.*, and Paul C. Rosenbloom. *Modern Viewpoints in the Curriculum.* New York: McGraw-Hill, 1964.

[9] Bruner, Jerome S. *The Process of Education.* Cambridge, Mass.: Harvard University Press, 1961. An inexpensive edition was brought out in 1964 by Atma Ram & Sons, Delhi.

in audio-visual methods. The planners of the conference were right in their assumption that it should not be restricted exclusively to the teaching of science, for the eventual problem would be more general than that and it would be in the interest of perspective to compare the issues involved in teaching science with those in a humanistic field, such as history.

This small book[10] comprises six chapters. It is not proposed here to summarize each chapter of the book but to bring into prominence the answer the author gives to a question he himself poses: "Students, perforce, have a limited exposure to the materials they are to learn. How can this exposure be made to count in their thinking for the rest of their lives ?"

Bruner's opening chapter, "Introduction", is important for not only does it explain the arrangement and structure of the whole book but it gives also an overview of its contents. He starts with a statement almost similar to that of Foshay. "What may be emerging as a mark of our own generation is a widespread renewal of concern for the quality and intellectual aims of education—but without abandonment of the ideal that education should serve as a means of training well balanced citizens for a democracy." This, he says, has led to several striking developments :

1. Distinguished university scholars and scientists have been preparing courses of study for elementary and secondary schools not only reflecting recent advances in science and scholarship but also embodying bold ideas about the nature of school experience.

2. The objective of this work is mainly to present subject-matter effectively —that is, with due regard not only for coverage but also for structure.

3. As a consequence, new questions about our conceptions of learning and teaching are being raised, e.g., what are the implications of emphasizing the structure of a subject ?

4. The study of "transfer" of learning in psychology has assumed a new importance. Virtually all the evidence of the last two decades on the nature of learning and transfer has indicated that, while the original theory of formal discipline was poorly stated in terms of the training of faculties, it is indeed a fact that massive general transfer can be achieved by appropriate learning,

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[10] The Delhi edition has 92+*xvi* pages.

even to the degree that learning properly under optimum conditions leads one to "learn how to learn".

5. There is an increasing realization of the fact that if all students are helped to the full utilization of their intellectual powers, we will have a better chance of surviving as a democracy in an age of enormous technological and social complexity.

The next three chapters of the book are premised on a central conviction: intellectual activity anywhere is the same, whether at the frontiers of knowledge or in a third-grade classroom, the difference between the two being in degree, not in kind.

The chapter on "Importance of Structure" explains at some length what is meant by the structure of a discipline, a term which recurs in the new educational literature. "Grasping the structure of a subject is understanding it in a way that permits many other things to be related to it meaningfully. To learn structure, in short, is to learn how things are related."[11]

A curricular proposal dominant at present is that pupils are to be given an understanding of the fundamental structure of whatever disciplines in the form of school subjects are taught to them. Physicists, specially, have affirmed that the principles of physics can be grasped by school pupils without being too much diluted. They therefore plead that the disciplines should be approached directly, without the intervention of "the middle language"[12].

The emphasis thus is also on discovery as a method of teaching.[13] Not a new emphasis one may say, but then it is to be remembered that the discovery is to be of the disciplines to be studied. A subject discipline is a way of making or discovering knowledge. Every organized discipline is characterized by: (i) what it purports to deal with; (ii) some rules it uses for asserting generalizations as truth; and (iii) its peculiar history.[14] This discovery thus is not only of the method but also of the organization, and will facilitate the reorganization of hitherto unrecognized relations in the mind of the student.

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[11] Elsewhere (Structures in Learning. *N.E.A. Journal*, May 1963, 26-27) Bruner says: "Every subject has a structure, a rightness, a beauty. It is this structure that provides the underlying simplicity of things, and it is by learning its nature that we come to appreciate the intrinsic meaning of a subject".

Cf. also Foshay (p. 142 *supra*).

[12] Cf. the dualism of Phenix between "the specialized logic of the disciplines" and "the largely unrelated psycho-logic of teaching and learning." (p. 141 *supra*.)

[13] Bruner, J. S. The Act of Discovery. In *Harvard Educational Review*, Winter 1961, 21-32.

This can lead to four advantages: (i) it will help transfer in the sense spoken of earlier and make later learning easy; (ii) it will help memory by the facility it affords in clustering ideas, facts and phenomena, the principal problem of human memory being not storage, but retrieval, the key to which is organization; (iii) the reward it offers—that of intellectual excitement—can provide stimulus enough for learning; and (iv) it closes, or at least reduces, the hiatus between "higher" knowledge and "elementary" knowledge, for by learning structure, which is the language of the scholar, the learner is brought closer to the leading edge of the discipline.

If this position is accepted, the problem is two-fold: "first, how to have the basic subjects rewritten and their teaching materials revamped in such a way that the pervading and powerful ideas and attitudes relating to them are given a central role, and second, how to match the levels of these materials to the capacities of students of different abilities at different grades at school".

The problem in both its facets is being solved by putting the best minds in a particular discipline to work on the task, for only thus can the fruits of scholarship and wisdom be brought to the student beginning his studies. To their assistance are also brought outstanding elementary and secondary school teachers and, for special purposes, professional writers, film makers, designers and others required in such a complex venture.

The third chapter on "Readiness for Learning" starts with the hypothesis that "any subject can by taught effectively in some intellectually honest form to any child at any stage of development".[15] In support of this hypothesis, there are long quotations from Piaget, Page and Inhelder, which speak chiefly of the development of mathematical concepts in children and reinforce the conference's standpoint that rigorous and relevant early training has the effect of making later learning easier.

[14] Cf. Foshay's main elements in a discipline (pp. 142-143 *supra*).

[15] Cf. the statement made by Lee J. Cronbach (The Psychological Background for Curriculum Experimentation. In Paul C. Rosenbloom, (Ed.) *Modern Viewpoints in the Curriculum*. New York: McGraw-Hill, 1964, p. 27): "The hypothesis of the Bruner Report is a thoroughly reasonable one, if we put it in this form: Whatever your ultimate objective, the child at any age is ready for some experience that will move him toward that objective more readily than if he is left to unguided activity".

Bruner goes on to analyse the act of learning and concludes that the learning process needs to be studied in detail and that much research has to be done on it. He suggests also that we must know more of the role of interest and curiosity and the lure of discovery in the act of learning.

All this leads him to conclude that a curriculum should be "spiral" in nature, built around the great issues, principles and values that a society deems worthy of the continual concern of its members. The curriculum at every stage is to be re-examined with an eye to the issues of continuity and development.

Professor Inhelder, in the quotation referred to earlier, speaks of the importance of "probabilistic thinking". In the next chapter of the book, Bruner is concerned with intuitive and analytic thinking, the importance of a student's intuitive, in contrast to formal, understanding of the subjects he encounters This theme he has elaborated in a later book[16]. He thinks that this aspect of psychology has been neglected so far and that more research is needed in this direction. He however warns his readers and future researchers against the confusion that may arise from the failure to recognize that there are two kinds of self-confidence, which often compel students to make intelligent guesses. One kind is a trait of personality and the other comes from knowledge of a subject. He trenchantly says: "It no particular credit to the educator to help build the first without building the second. The objective of education is not the production of self-confident fools".

The fifth chapter is titled "Motives for Learning". In this, Bruner has some hard things to say about the prevailing state of affairs in American schools, but they are different from what other critics, e g., Bestor, had to say. He first mentions that "studies of American high school culture point particularly to the higher value placed on social popularity than upon academic achievement", which implies that American schools arouse short-run interest instead of a long-term establishment of interest in the broader sense. The latter he considers to be a very important motive for learning; otherwise passivity may result, which is a danger in an "entertainment-oriented, mass communication culture".

"Our cultural climate", he says then, "has not been marked traditionally by a deep appreciation of intellectual values". As however, he thinks that admiration for scholarship is bound to increase, he stresses the need for careful planning so as to avoid "a meritocracy based upon a system of competition" where scholarships and prizes become the goal, thus stifling the real aim of excellence.

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[16] Bruner, Jerome S. *On Knowing.* Cambridge, Mass.: Harvard University Press, 1962.

To counteract the passivity he speaks of earlier, and in consideration of the fact that science and technology will continue to be stressed in the curriculum, Bruner also pleads for an equal amount of care and energy to be devoted to the humanities and social sciences—comparable to that now being given to science and mathematics. America must, he says, maintain and nurture a vigorous pluralism.

The last chapter of the book deals with "Aids to Teaching". The author discusses the nature of aids and says that only those aids which help the student to grasp the underlying structure of a phenomenon are really aids to learning and teaching. An aid, however excellent it may be, cannot obviate the necessity of a teacher's mastery of the knowledge to be communicated. Nothing can, he concludes, take the place of a good, sensitive teacher who not only communicates knowledge but serves also as a model. "Problems of quality in a curriculum cannot be dodged by the purchase of sixteen-millimeter projection equipment."

Thus ends a remarkable book, to which no summary can do justice. His conclusions we may not all agree with, but Bruner forcefully, cogently and logically extends a view-point from which emerges a new perspective on education, so long largely neglected in America, and from which we in India are perhaps thinking of gradually drifting away.

The picture presented in this article will not however be complete unless we refer also to the other side. Below, therefore, is summarized another paper[17] by no less a person than Hollis L. Caswell, lately President, Teachers College, Columbia University.

Caswell begins with the historical development of the curriculum for the American school to show how in the thirties of this century it was more or less agreed that the primary purpose of the high school was not to prepare students for colleges and universities. Very interestingly, he points out at the same time that Dewey, who had revolted against the deadly formalism which characterized the school curriculum during the period when university subject-matter specialists dominated its design, was by 1930 calling greater attention to the role of organized subjects in a sound education. He goes on to quote from Dewey.[18] "The trouble with traditional education was not that it emphasized the external conditions that enter into the control of experiences but that it paid so little attention to the internal factors which also decide what kind of experience is had. It violated the principle of interaction from one side. But this violation is no reason why the new education should violate the principle from the other side."

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[17] Caswell, Hollis L. Difficulties in Defining the Structure of the Curriculum. In A. H. Passow, (Ed.) *op. cit.*, pp. 103-111.

However, Caswell then raises certain issues out of Bruner's book "which should have special consideration in appraising the new trend". The first issue is "Subject Matter as Part of Structure". Quoting some specialists in different fields, he points out two difficulties in defining the structure of the disciplines: (i) specialists in the academic disciplines do not seem too certain as to what exactly is the structure of the knowledge they deal with; and (ii) one structure of the field alone cannot possibly exhaust its usefulness.

The second issue is "Interrelationships of Academic Subjects" and the difficulty he envisages is in the process of relating knowledge from various fields to a problem. He quotes Whitehead on "the fatal disconnection of subjects which kills our modern education". Further, while he believes in the association of subject-matter specialists and teachers in the task of curriculum-making, he deplores the by-passing of the other groups concerned in this task, e.g., those who bridge the gap between the subject and the learner and who have to administer a curriculum to the school. "I believe the generalist is essential as mediator and stimulator."

He then raises the third issue, "Age as a Criterion", and questions the introduction of the disciplines at too early an age. "In our affluent society, why not give our children and youth opportunity for broad learnings, as free of frustrating and limiting pressures as possible?"

He however enumerates some points upon which general agreement could be achieved :

1. Facts, concepts and methods of work emphasized and developed by the various subject-matter fields are essential ingredients of education.
2. It is essential that the material drawn from the various subjects be reliable and up to date.

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[18] Dewey, John. *Experience and Education.* New York: The Macmillan Company, 1938, p. 39.

3. Organization of knowledge by the learner is a helpful, if not an essential, means of insuring its future use.

Caswell thus is not so much opposed to teaching the structure of the disciplines as he is to introducing them in the earliest classes to the neglect of inter-relationships of academic subjects. Also, he is rather critical of the proposed method of organizing knowledge and feels that perhaps too simple an answer to a complex problem is being emphasized.

The time is fast approaching when we in India will need a set of principles to guide the construction of the curriculum for our schools. In that process, we shall have to ponder over every recognized principle of curriculum construction, and the structure approach to the disciplines, which we can recognize today to have become a live issue, will then need from us the careful attention it deserves.

B. GHOSH

*B. Ghosh is Head of the Department of Curriculum, Methods and Textboo
National Council of Educational Research and Training, New Delhi.*

Educational Technology
and
Programmed Learning

Training, Research and Education
R. Glaser, (Ed.). University of Pittsburgh Press, 1962.

Educational Technology. Readings in Programmed Instruction
J. P. Dececco, (Ed.). Holt, Rinehart & Winston, New York, 1964.

New Methods and Techniques in Education
Educational Studies and Documents, No. 48. UNESCO, Paris, 1963.

For some of us in India, the term "educational technology" is a self-contradiction. We consider education as being more akin to speculative philosophy, or at best as an intuitive art, rather than a technology. But as science has encroached into most other dimensions of physical life, it is entering also the arena of human behaviour. The sciences of behaviour now claim that education should be seen as an application of their laws to the teaching-learning process.

> The process of training and education is concerned with techniques and procedures for guiding and modifying human behavior. A student comes to school with a past history that manifests itself in the ways in which he performs at the time of entrance. It is the task of the teacher and the school environment to enable the student to leave a school term with new or modified ways of behaving, so that he can now read a book and answer questions about it, translate a foreign language, repair a piece of electronic equipment, diagnose a disease, do research on atomic structure, or produce a work of art. The purpose of an educational system, with its teachers, textbooks, audio-visual aids, teaching-machines, and so forth, is to create the conditions that will cause this new or modified student behavior to occur The practical task is to perform certain operations, generally referred to as "educational methods" or "instructional techniqes", that result in definable changes in accordance with specified instructional objectives.[1]

Some people may object to considering education in such operational terms. They feel that education is indefinable and goes on from the cradle to the grave. In many instances it is self-education, and in many others, we do not know the sources from which we get it. The behavioural scientist does not disagree with the claim that education continues from the cradle to the grave; nor does he disagree with the statement that a person gets educated from a variety of sources, including himself. His only plea is that education, from whatever sources and at whatever age, should be considered as a process of behavioural modification. As such it can be further sub-divided for investigational purposes into the following four components: (i) instructional goals—the system objectives; (ii) entering behaviour—the system input; (iii) instructional procedures—the system operator; and (iv) performance assessment—the output monitor.

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[1] Glaser R. (Ed) *Training, Research and Education.*

Instructional goals may be cultural, ethical or, expressed in another context, cognitive, affective or conative. These goals will have to be specified in terms of observable indices. This is not to say that if at present we do not have an adequate terminology of objective indices for describing certain goals, the goals need not be considered at all. The demand of the scientist is to find out the observable indices for the felt educational goals, so that procedures for achieving these goals may be specified or devised, and also evaluated, in terms of their effectiveness or ineffectiveness in achieving these goals. Unless one knows what goal he wants to reach, he would never know whether a certain strategy or method or technique helps him in reaching that goal. The difficulty at present of describing such educational goals in operational terms is evident, but the behavioural scientist feels that it is not insurmountable. He further emphasizes that unless this difficulty is overcome one cannot assess a method for its effectiveness, whether it comes from Froebel or Dewey or Gandhiji or Tagore. So far in education, we have tried to follow methods on the basis of the recommendations of great educationists, all intuitive artists. The methods suggested by them possess many good points. But we shall never be able exactly to sift the chaff from the grain unless we specify the exact roles or effects of the different elements of these methods and the goals they strive for. A further distinction which may be helpful in this context is that between an index and a construct. An atom may not be observed but many physical indices can be inferred from the construct of an atom, which can be observed by specified procedures. Similar should be the case of educational goals like "achievement in mathematics" or "democratic attitude". The behavioural scientists, joined by educators, have entered the arena of analysing educational goals, as this analysis is crucial for any technology to develop in education.

The next component of the educational technology, "entering behaviour —the system input", is also an important one, although it is the most neglected in the present system of education. For example, when a lecturer in a college gives his first lecture at the beginning of an academic year, let us say in physics, to a first-year class, he does not know what the previous levels of attainment of the different students in his classroom are. Even if he knows that student X got 50 per cent marks in his Higher Secondary examination and student Y got the same, he cannot infer from this that both have an identical knowledge of content and both suffer from the same misconceptions in the particular topic in physics which he is teaching. But unless he knows what the different students know, and what their misconceptions are, it is really impossible for a conscientious teacher to deliver a lecture and feel that his students have comprehended what he aimed to teach. The behavioural scientist would like to take a close look at the entering behaviour because he feels that it may differ from individual to individual, and on this entering behaviour depends what a person is to be taught and how.

The importance of the third component is usually conceded by all educators. But the effectiveness of a certain procedure, generally called a teaching method, is determined more in terms of who discovered it or who followed it rather than in terms of the students' behaviour, measured objectively. Discussions on methods in education hence become more philosophical, bordering on political feuds, and like many other issues in metaphysics or politics cannot be settled. The behavioural scientist does not want to get entangled in philosophical or political wrangles over whether basic education is better than progressive education or whether Montessori education is better than kindergarten education. He feels that these methods should be analysed to see specific similarities and discriminations. Some of the techniques which are claimed to produce certain effects may not produce those effects but quite different ones instead. All these matters are to be investigated empirically. For a scientific study, the variables underlying these procedures need to be defined in operational terms and brought under the control of the experimenter.

The importance of the fourth component is also generally agreed upon by educators. But here again there is more lip sympathy than concrete attempts at assessing the procedure in terms of the output on the one hand, and on the other, the instructional goals and the output specified in the beginning. In India we still have a large group of educators who feel that educational achievement cannot be measured objectively. The best that they can do is to administer essay-type tests. That there could be objective tests or procedures to measure not only educational objectives in the cognitive domain but also those in the affective and conative domains is not very clearly perceived by many of our educators. The educational technologist would like to emphasize that such assessment procedures have to be devised if we have to make any judgment regarding any method of education or regarding the realization of instructional goals.

At present, the educational technologists cannot claim that they have completed their task of analysing the teaching-learning process in the above four components, developing the taxonomy of educational objectives and developing the procedures for attaining and assessing those objectives. But many of them feel that the method of programmed learning has begun an era which will ultimately bring in educational technology. This is not to say that programmed learning will necessitate teaching-machines, i.e., electronic hardware. Programmed learning may use various devices—books, films, television, teaching-machines such as computers, and for that matter, the human being called a teacher. The essential characteristics of the method are: (i) controlled presentation of material; (ii) the elicitation of appropriate response; (iii) guidance with respect to the subject-matter; (iv) control of the way in which learning proceeds; and (v) constant assessment of performance. Programmed learning material in this context can be defined thus:

> A programmed learning material or auto-instructional material or teaching-machine programme (all mean the same thing) is any teaching material which leads a student by :
>
> (*a*) Very short logically and/or psychologically related steps, resulting in
> (*b*) few errors, so that he
> (*c*) practises correct responses rather than errors, and these are
> (*d*) reinforced immediately by knowledge of results, so that he makes
> (*e*) successively closer approximations to the responses which are the desired goal.[2]

The labels for the programmed learning method may differ from one country to another but, essentially, the principles of instructional technology underlying programmed learning are being followed by various innovators in educational material in countries like the United States, the United Kingdom, East Germany, Russia and Japan. The Unesco Expert Committee on "New Methods and Techniques of Education", after reviewing the researches in the field, suggested that "special emphasis should be placed on development of the potential of the individual programmed instruction method whose unique advantages and relatively recent development provide a major addition to our educational resources in the struggle against ignorance".[3]

The researches in programmed learning have not only helped develop programmed learning material in subjects ranging from the physical and behavioural sciences to logic and ethics, but have also shown that the method is applicable for all age groups, from pre-primary to adult. Programmed learning is not a method in the sense in which traditional methods like the Froebelian or Montessorian are. Programmed learning is more a scientific approach than a closed method to find out the best teaching-learning strategy, given certain instructional goals and the entering behaviour. Skinner or Growder may have developed certain strategies which may be termed linear, branching, etc. But neither of them claims that his is the only method and that it should be labelled after his name. Neither says that a particular method should be followed because it is recommended by him. Their plea is that one can develop teaching-learning material by following the scientific approach and applying the laws of behaviour to the learning process. These strategies of programming are products of the application of the laws of behavioural sciences to certain modes of learning.

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[2] & [3] UNESCO. *New Methods and Techniques in Education.*

In addition to the benefits received in terms of the programmed learning material, instructors in courses in educational psychology and curriculum are discovering the following benefits for the pupil-teachers who undertake a project on programmed instruction;

1. The project impresses upon the pupil-teachers the need to specify instructional objectives;
2. It results in improved comprehension of the subject-matter (because of the comprehensive task analysis that has to be prepared before one starts writing programmed material);
3. It clarifies the relationship between teaching and testing;
4. It enables the pupil-teacher to observe the effects of learning variables and provides experience for the manipulation of these variables.[4]

A word may be in order regarding a new dimension in testing emphasized by the researchers in programmed learning. They argue that for assessing the effectiveness of programmed learning material, and for that matter any educational material, one should use the performance reference test rather than the norm reference test. They point out that the present system of devloping norms for a test gives us relative ranks but does not tell us exactly how much is comprehended by a student. For example, on a given achievement test, a student who gets 50 marks out of 100 may be ranked first. But this ranking does not tell us what part of

[4] Dececco, J.P. (Ed.) *Educational Technology: Readings in Programmed Instruction.*

the knowledge the student is lacking in, or more technically, which particular sub-tasks he cannot perform. Two students who get the same number of marks may have committed entirely different mistakes in the test, thus indicating their failure to comprehend quite different concepts or perform quite different sub-tasks. This type of test and procedure of scoring do not help us to plan the next step in the teaching-learning process. Two students who have got the same number of marks may need quite different educational treatment as regards the teacher's guidance and educational material. Tests will have to be devised and scored in such a way that the teacher or guide gets a clear picture of a student's strengths and weaknesses in terms of performance of sub-tasks. Then only can the teacher or guide plan the next step of the treatment for improving the weaknesses in the performance of the student. Programmed learning would require, and also enable, a test constructor to work on these lines.

The additional benefit earlier referred to also needs some comment. Many of our researches in the teaching-learning process could not yield clear-cut results —positive or negative—because most of the variables remained uncontrolled. The so-called conventional method—teachers lecturing or asking questions, etc.,—will always remain outside the complete control of the experimenter. One teacher may not follow the same method as another although both may use the same label to describe their respective methods. Hence one cannot arrive at any generalization from investigations into such a method or by comparing one such method with another. Now, with the technique of programmed learning, the experimenter can control the stimuli and vary them as required by the design of his investigation. Now it is possible to answer questions such as: Is prompting or confirmation more effective? What are the different kinds of prompts needed? How can students be weaned away from the prompts provided in the beginning of the teaching-learning process? Which of the strategies used in the teaching-learning process is more effective in terms of the students' achievement? What are the different modes of responses that are attained, and by what treatment? All these and many other problems can be attacked now with the full rigor an experimental scientist desires.

This discussion on educational technology and programmed learning is only a pointer to what is coming. We may not aspire to have computer-based programmed learning materials which cater for various, individual, entering behaviours. But we may at least recognize the need for analysing the teaching-learning process and investigate the relationships between stimulus and response variables and thereby improve our educational process as far as is feasible under our current economic restraints. It is quite conceivable to find out strategies based on the principles of educational technology which may use a mechanical device, a teacher, or a book, to suit the Indian economy. Work must start in this direction in spite of the usual temptation to go on talking about lofty ideals without either defining them or specifying procedures for achieving them.

S. S. KULKARNI

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S. S. Kulkarni is Senior Research Officer in the Department of Psychological Foundations, National Council of Educational Research and Training, New Delhi.

Child Rearing Practices
Some Trends in Research

Six Cultures—Studies of Child Rearing
Beatrice Whiting, (Ed.). John Wiley & Sons, New York, 1963.
Mothers of Six Cultures—Antecedents of Child Rearing
Leigh Minturn and William W. Lambert, John Wiley & Sons,
New York, 1964.

The impact of early childhood experiences on the development of personality was first brought into focus by Freud. The idea triggered off work in different directions and provided the basis for culture-personality studies. Margaret Mead's (1939, 1949, 1951) studies of some of the primitive cultures have raised several issues—methodological as well as hypothetical. Most of Mead's studies follow the natural history approach in which the field workers carefully observe day to day ordinary life situations, keep a record of the actual behaviour, give an account of the context in which this behaviour occurs, and arrive at a categorical judgment. Methodologically, this approach has many shortcomings but it is interesting to note that some of these observations have been validated by later empirical studies which are relatively more scientific and broad based. Mead's studies of child rearing practices in primitive cultures have thus provided a basis for forming hypotheses.

In a study by Whiting and Child (1953), cultural data pertaining to seventy-five primitive societies were analysed in terms of five systems of behaviour—oral, anal, sexual, dependence and aggression. Since these data were collected for different studies by diverse observers at different times, there was no common frame of reference. For each system of behaviour, judges were asked to rate ages, techniques of socialization and conditions producing satisfaction as well as those leading to socialization anxiety. The correlational testing method was employed to determine whether any significant connection exists between the antecedents and consequents of child rearing practices.

The study of child rearing practices by Sears and others (1957) was confined to mothers of a New England community. On the basis of open-ended questions, trained personnel conducted standardized interviews which were recorded, transcribed and rated. Various personality characteristics of children were also measured. The major consequent areas of investigation were dependency, aggression, guilt and identification; the antecedent variables were nurturance, techniques of socialization and the demands made upon the child. This study was focussed on child rearing practices which facilitate development of identification with parents. This is the first empirical study in the area of child rearing practices.

The hypothetical framework provided by the psychoanalytic theory, the natural history approach and the method of absolute judgment sharpened by Mead, the correlational testing method as applied to the cross-cultural data of child rearing by Whiting and Child, and the standardized mother-interview with open-ended questions, designed by Sears and others, have provided the basis for the cross-cultural study of child rearing in *Six Cultures.*

The book is a collection of six monographs compiled by Beatrice Whiting. The six cultures are six rural and semi-rural communities in Mexico, India, Philippines, Okinawa, Africa and U.S.A. The study was undertaken by a group of social scientists from Harvard, Yale and Cornell universities. The primary aim was to investigate the different patterns of child rearing prevalent in six different rural communities and to study the effects of methods of rearing children on subsequent personality development. Each of these monographs is divided into two main parts. The first part describes the ethnographic background of the community in which the child is born; this is a comprehensive account of the basic economy, social organization, daily routine, sex and marriage, religion, recreation, political structure, death, disease, the supernatural, and the educational system. The second part contains a description of the methods of child training. This includes an account of pregnancy and child-birth, weaning, toilet training and responsibility training, status of the child, sleeping and eating, cleanliness and clothing, relationship to parents, siblings and peers, techniques of socialization, control of aggression and sexual behaviour, and training in obedience. Special emphasis was given to the study of aggression, dependency and mechanisms of behaviour control—rewards and punishments. Data were collected through questionnaires and observations. The design of mother-interviews is similar in many ways to that of Sears *et al.*, described in their book, *Patterns of Child Rearing.*

Mothers of Six Cultures is based on an analysis of interviews (conducted by field workers) with mothers of children who formed the sample in *Six Cultures.* This study is unique in the area of child rearing in that it has evolved its own tools and methodology and has effectively demonstrated that it is possible to study common dimensions of behaviour in different cultures even though the manifestation of a certain behaviour pattern may be very different across cultures. These mother-interviews were aimed at collecting information about the prevalent child rearing practices and about why mothers preferred those. From the mother-interviews about a dozen scales were selected and factor analysed by a centroid method. The following seven factors were extracted:

1. Responsibility training
2. Warmth of mother
3. Aggression training; peer-directed aggression
4. Proportion of time mother cared for baby
5. Proportion of time mother cared for child
6. Aggression training; mother-directed aggression
7. Emotional instability of mother

Some interesting and significant observations may be mentioned here. One of these is the prevalence of different methods of child rearing in cultures possessing different forms of "maintenance systems" and living conditions in the household. Again, maternal warmth and hostility are determined by whether a mother lives in a nuclear family, extended family or stem family. The proportion of her time that a mother devotes to caring for children is determined by the availability of other adults in the household as well as the amount of time she has to devote to duties outside the household. This in turn determines her emotional stability. Mothers who spend a lot of time caring for children without being relieved are more unstable as compared to those who are helped out by other adults. When they have to contribute to the family income, mothers are likely to be less tolerant of aggression directed towards them by children. When they have other duties, besides looking after the household, they expect children to be more responsible at an early age.

Here comment may be made in some detail regarding the Rajput mothers in the sample. Significant differences were found between them and the other mothers in the various dimensions. For instance, the Rajput mothers of Khalapur were found to be the lowest in warmth.[1] These mothers seldom praised their children as a policy to discourage individuality and give training in compliance which is so very essential in an extended family. They were also much below the mean as regards the amount of time spent in looking after babies as well as older children. The fathers in the Indian sample ranked lower than those in other societies on the amount of time they spent in looking after babies. Rajput children ranked lowest in responsibility training.

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[1] The dimension of maternal warmth was defined thus : "Warmth may be manifested by playing with the child, enjoying him, doing things to please the child and others, demonstrating affection in words and action. Routine care-taking and amusing the child as part of a schedule, or as a matter of felt duty or responsibility, are not to be considered as automatically indicating emotional warmth. The use of reward and praise as techniques of inculcation is also not relevant to the scale *per se*. Signs of affection which are spontaneous with the mother should weigh more heavily in this rating than affection which comes only as a result of the child's or other people's solicitations".

Rajput mothers tend to discourage peer-directed aggression and generally tend to disapprove of children involved in a quarrel without attempting to determine the reasons for the quarrel and the individual children responsible for initiating it. They also do not insist upon obedience, and were found to be significantly higher than mothers of other cultures about tolerating aggression directed against them. The idea is to maintain peace somehow, and the issue at stake is of secondary importance.

These Rajput mothers did not make any contribution to the family income and were generally confined to their courtyards.

It is clear from the findings of this study that all these factors like responsibility training, aggression training (mother-directed and peer-directed), warmth of mother, proportion of time mother cares for baby and the emotional stability of the mother are affected by the house-type, the number of adults in house, the number of cousins living in the courtyard, the number of siblings in the house, the birth order, the number of male adults in the house, the number of women in the house, the number of older siblings, the mother's contribution to the family finances and the frequency of children's chores.

What could be the implications of these findings in the context of India's changing socio-economic structure? An understanding of the effects of the different kinds of child rearing practices might lead to a realistic assessment of the potential of our children. The prevailing heterogeneity of the socio-economic systems in our country calls for an extensive study of child rearing practices in different communities, castes and religious groups, and at different socio-economic levels. The studies of Mead, Whiting and Child, Sears *et al.*, etc., provide an excellent basis. It would be challenging to attempt to find an answer to the question whether an awareness of certain child rearing practices could help bring about a shift in the attitudes of parents and teachers who are primarily responsible for the welfare of children. Can there be education for child rearing? Will efforts to help parents develop competence in child rearing be fruitful? How much weightage should be given to parent education programmes, and what percentage of the budget allocations for education should be spent for this purpose? Which are the agencies that could effectively take up these programmes?

If education alone cannot bring about this change in attitudes on any appreciable scale then the only hope will lie in rapid industrialization as a result of which a new culture might evolve. Meanwhile, for spelling out priorities in educational planning, a study in this area may prove extremely fruitful.

INDIRA MALANI

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Indira Malani is Reader in Child Psychology in the Department of Psychological Foundations, National Council of Educational Research and Training, New Delhi.

Expectancy × (Motive × Incentive) Theory of Motivation

An Introduction to Motivation
J. W. Atkinson. Van Nostrand Company, Inc , Princeton, N J., 1964.

Psychologists have been interested in the study and measurement of individual differences for the last several decades. Attempts were made to measure interests with a view to making certain predictions about future performance or behaviour. These studies did not throw light on the process of human motivation. Not till the late forties were the problems of measuring human motivation and the experimental and conceptual analysis of motivation taken up. The work initiated by McClelland and co-workers (1948) on achievement motivation and that by S-R theorists led to a combination of the study of individual differences with the study of the process of motivation. Atkinson in *An Introduction to Motivation* has presented stimulating material on the historical development of the concept of motivation and on theories of motivation. He has reviewed a large number of studies and put them together, piece by piece, to usher in an emerging psychology of motivation.

SOME RELATED RESEARCH ON BEHAVIOUR

Darwin's Theory

Darwin's Theory of Evolution made an impact on several branches of knowledge. The following three implications of the theory have influenced the course of the psychological investigations: (i) animals may be capable of intelligent behaviour or reason; (ii) human behaviour may be influenced by instinct; and (iii) the importance of individual differences. These ideas heightened the interest in the relationship of mind to body. The work of James and Freud marks the beginning of the convergence of speculative thought about the springs of human action, and relevant observations of behaviour. Freud provided a great impetus for the science of motivation by his analysis of everyday slips, errors and dreams and by his study of the unconscious. His views contain the essential ideas of the theory, later known as *drive reduction*, which was formally developed by Clark Hull.

Lewin's views

Lewin's Field Theory called attention to the influence of the immediate environment. He characterized behaviour as a function of the total situation (B=F(P, E). (Lewin, 1935, 1951). He and his co-workers developed important concepts like Life-space, Force-field, Valence, Potency, Psychological Distance and Locomotion. They drew attention to the importance of the *contemporaneity* as against *historicity* of any event. The studies of level of aspiration revealed many interesting ideas. Certain atypical results were of particular importance. For instance, children with a history of success showed little variability as against those with a history of failure. The former maintained an atypical, small and positive goal discrepancy. Festinger (1942) pointed out that the Ss expectancy of success and failure at a given level of performance will define the relative potency of the valences of success and failure at that level. The expectancy or probability of success and the attractiveness of goals emerged as very important concepts in the psychology of motivation.

The "Purposivists"

Following Darwin's Theory of Evolution, there was a rapid growth of interest in the behaviour of the lower animals. "Associationists" led by Thorndike and "Behaviourists" led by Watson focussed attention on the observable change in an animal's response as a function of experimentally controlled past experience. McDougall and other "Purposivists" were arguing, more or less philosophically, that the immediate response to some stimulus must be viewed in the larger context of the animal's active striving for some goal. Edward Tolman later constructed a psychological theory to explain the inferred "psychological" variables which intervene between stimulus and response. His views were similar to those of Freud and Lewin; all three tried to develop an understanding of the psychological process. Tolman developed systematic views and called them "purposive behaviourism" and "operational behaviourism". The first expression emphasized goal-seeking as the most important characteristic of molar behaviour. The second meant that the views were testable by other independent observers.

The S-R Behaviour Theory

Hull's famous *Principles of Behaviour* appeared in 1943. From the very outset, he used the term "motivation" as a synonym of the term "drive". In him, as also in Freud's concept of "libido" we find drive as a general emerging concept and as one of the immediate determinants of action. For Hull, drive is produced by biological need, as a general activator of response tendencies. Besides drive, he identified habit (sH) which, together with drive, intervene between observable S and R in the determination of present behaviour. These two together are the determinants of reaction potential. This is expressed by Hull thus: $sE=f(sH)\times f(D)$.

The S-R language has (rightly or otherwise) come to dominate discussion of motivational problems. This is perhaps partly due to the spur given to systematic research by Hull's theory and partly due to the fact that the experimental variables and observable responses are manipulable. Many useful developments have occurred within the framework of this language. Mowrer (1939) introduced the concept of fear (or anxiety) as an acquired drive. Miller (1948) showed how fear may be conceived as a drive and fear reduction as reinforcement in the learning of new responses. Miller and Dollard (1941) defined drive as a "strong stimulus which impels action". This view differed from Hull's earlier position that drives are produced by biological needs.

Miller's theory of the approach-avoidance conflict (1944, 1951, 1959) is another important addition to the conceptual framework of the S-R behaviour theory. His basic assumption of gradients of approach and avoidance is similar to Lewin's conception of valence. Spence's (1956) concept of incentive motivation (K) was a fundamental revision of the S-R theory which accounts for the immediate determinants of the reaction potential. In view of new experimental facts, Hull revised his theory in 1952. He introduced the amount of incentive as a separate motivational variable (K) in the equation for reaction potential, (sE): $sE=D\times K\times sH$.

Spence (1956) revised the theory further. He refers to the immediate determinants of the impetus to respond as excitatory potential (E), which Hull called reaction potential. He combines E, K, D and H (habit) as: $E=(D\times K)\times H$.

With the introduction of incentive motivation K, the formulations of Tolman and Lewin on the one hand and the S-R behaviour theory on the other, come very close to each other. These agree on asserting that the goal anticipation should be represented as one of the potent contemporaneous determinants of molar action.

THE STUDY OF HUMAN MOTIVATION

The vast wealth of contemporary and earlier research on behaviour has contributed greatly to our understanding of human motivation. Three current developments relevant to the formulation of a theory of human motivation can be identified: (i) experimental interest in human decision-making; (ii) systematic studies of the facts of individual differences in anxiety; and (iii) the study of achievement motivation.

Theorists working in the area of decision-making have also contributed to our understanding of human motivation. Edwards, in 1962, pointed out two important issues common to certain groups of scientists working on topics allied to motivation: (i) Is the variable which Tolman called "expectancy", Lewin called "potency", and which decision theorists called "subjective probability" the same? (ii) Is the variable which Tolman called "demand for the goal", Lewin called "valence", and which decision theorists called "utility" the same? Irwin (1953) and Marks (1951) showed that positive outcome seems more likely to the subject than negative outcome. It is now generally recognized that the concepts referred to by Edwards are similar.

In spite of the similarities in concepts, there is an essential difference between Expectancy × Value theories and the conception of the S-R behaviour theory of Drive × Habit. It is now fully appreciated that anticipatory goal reaction (rg) and anticipatory emotional reaction (re) are immediate determinants of instrumental actions. The research on anxiety has been guided by and interpreted in terms of the Drive × Habit theory, while the empirical studies of achievement motivation have produced a theoretical conception of the Expectancy × Value type.

THE STUDY OF INDIVIDUAL DIFFERENCES IN ANXIETY

The practical-problem orientation of earlier psychologists led to a number of studies on individual differences. Edward Strong published his famous Strong Vocational Interest Blank in 1927. Several clinical methods were developed to assess the human motivation in connection with clinical practice. There were attempts to study individual differences in motivation. Since the early fifties, a number of interrelated studies of effects of individual differences in anxiety have been undertaken to explore hypotheses derived from the S-R behaviour theory. Two such attempts need attention here. Taylor, Spence and others employed the Manifest Anxiety Scale (MAS) developed by Taylor (1953). These studies consider fear or anxiety as an anticipatory emotional reaction which is a source of non-specific drive. Sarson and co-workers employed the Test Anxiety Questionnaire (TAQ) to study the strength of fear or anxiety that is normally aroused in a person in the achievement-test situation. Several experiments employing the MAS showed that the performance of non-anxious subjects improved following failure, as a function of the degree of failure. Studies employing TAO showed that failure produces opposite effects on the subsequent performance of 'High' and 'Low' anxiety groups.

These two groups of studies present the same problem of interpretation that arose in studies of drive in lower animals. Neither of these theoretical concepts explain very adequately why a person who scores low on a test of anxiety performs better under stress than when conditions are more relaxed. These results can be understood better with the help of research on achievement motivation, which represents another fresh start in the search for a theory of motivation.

THE STUDY OF ACHIEVEMENT MOTIVATION

At the time when Hull was expanding his framework of S-R principles, Murray was trying to describe personality in terms of basic psycho-genic needs. He invented the famous thematic apperceptive technique for the study of personality. He conceived need as a construct which stands for a force in the brain region, a force which organizes perception, apperception, intellection, conation and action in such a way as to transform in a certain direction an existing unsatisfying situation. Sanford (1936, 1937) studied the effect of hunger on the imaginal process with the help of the thematic apperception technique. McClelland commenced studies to discover how motivation was expressed in the content of imaginative stories. He and his co-workers developed categories of responses which finally corresponded to various features of typical goal-directed sequences of actions. Atkinson and McClelland (1948) concluded that the apperceptive behaviour can be described like any other type of behaviour. McClelland (1953) has summarized researches on thematic apperception as a measure of human motives. The results show that the achievement-related imaginative responses provide a measure of the heightened state of motivation produced by achievement-oriented instructions. Clark (1953, 1955, 1956) made interesting studies of sexual motivation. He found that the sexually aroused group expressed significantly less manifest sexual content in their imaginative stories than the control group. Later he found that under alcoholic conditions the aroused group produced more manifest content related to sexuality than the control group.

Use of thematic apperception to study individual differences in motivation

Three types of factors influence the *n* Ach score: (i) cues of the immediate situation and instructional responses; (ii) cues contained in pictures; and (iii) when the above two factors are controlled, individual differences in motivation. The imaginative behaviour can be described by Lewin's equation: $B=f(P, E)$. The first two factors are the environmental determinants and the last factor relates to the person.

Achievement motivation and performance

Lowell (1952) found a high *n* Ach score to go with a higher level of performance. Atkinson's study of the relationship of *n* Ach scores to the Zeigarnik effect showed that the arousal of a tendency to approach success is jointly determined by the achievement motive and the expectancy that certain actions will lead to success. In certain cases persons with low *n* Ach scores perform better, or even more, than those with high *n* Ach scores. Following Tolman's concept of expectancy, a guiding hypothesis was adopted to explain such a behaviour: the goal-directed action tendency is a joint function of the strength of the motive and the expectancy aroused by situational cues that performance is instrumental to attainment of the goal of the motive.

The theory of achievement motivation

The theory of achievement motivation seeks to account for determinants of the direction, magnitude and persistence of behaviour in a limited but very important domain of human activities. It applies when a person knows that his behaviour will be evaluated in terms of some standard of excellence and that a consequence of his actions will be either favourable (success) or unfavourable (failure). In other words, it is the theory of achievement-oriented performance.

Certain facts stand out strikingly from the various researches on achievement motivation, as in McClelland's exploration of risk-taking in children (1953), and in Winterbottom's study (1958) which found boys 'High' in *n* Ach rated by their teachers as showing more pleasure in success than boys who score 'Low' in *n* Ach. Raphelson (1957) found a correlation of –.43 between *n* Ach scores and test anxiety. Moulton *et al.*, (1958) found that a test-like situation enhanced performance among persons 'High' in *n* Ach and produced decrements in the performance of persons showing 'Low' in *n* Ach. Studies of anxiety show that persons who score 'High' in anxiety suffer decrements in performance of complex tasks in competitive situations.

Important situational determinants

There was a need to develop some kind of conceptual frame to relate the various facts to one another. Following Tolman, the situational determinants should be conceived in terms of two variables: (i) the extent to which the individual expects that his performance will lead to the goal; and (ii) the extent to which this success has an incentive for the individual. McClelland has emphasized that the individual must consider himself responsible for the outcome (success or failure) in achievement-related performance. This assumes some explicit knowledge of results of the performance and some degree of risk concerning the probability of success in future performance.

The tendency to achieve success

Following the above, it was possible to assume that the tendency to achieve success is a multiplicative function of the individual's motive to succeed, his probability of success at the task and the incentive value of this success or goal. This is expressed as: $Ts=Ms \times Ps \times Is$. The values of Ps and Is depend upon the individual's past experience in a specific situation similar to the one he now confronts. Ms is a relatively general and stable characteristic. When a task appears difficult, the Ps is low. When it appears easy, Ps is high. In other words, the difficulty of the task, as it appears to the individual, equals $1\text{-}Ps$.

The tendency to avoid failure

Pf is strong when Ps is weak and *vice versa*. Following the proposal advanced by Escalona (1940), Festinger (1942) and Lewin (1944), it is assumed that the shame and embarrassment of failure is normally greater when the task failed appears easy, than when it appears very difficult. The tendency to avoid failure can be expressed as a multiplicative function of the motive to avoid failure, the probability of failure and the incentive value of failure. This can be expressed as: $T\text{-}f=MAf \times Pf \times If$.

The total strength of the tendency to avoid or approach tasks in an achievement-related situation equals achievement-related motivation (that is $T+T-f$) plus extrinsic motivation. The latter means the strength of the tendency to act when it is attributable to other motives and incentives.

Expectancy of success: An important motivational variable

The assumptions here are: (i) ability is an index of probability of success; (ii) MAS provides a measure of the motive to avoid failure (MAF), that is normally aroused in achievement-related academic performance. It is apparent that the subjective value of success (what Tolman referred to as demand for success, Lewin as valence of success, and decision theory as utility of success) is a multiplicative function of Ms and Is ($Ms \times Is$).

As Ps approaches 1.00, satisfaction or loss of interest should occur. The task no longer arouses any motivation at all. Hence, when free to choose, the person who has a strong achievement motive should always look for new and more difficult tasks as he masters old problems. If a person has initially chosen the task at which Ps=.50, and he fails, the Ps is reduced. After one or more failures the Ps at the initial task will have dropped below .50. The person will then change to an easier task. This change constitutes lowering of the level of aspiration. "If the initial task is perceived by the person as very difficult to start with (Ps=.50) motivation should begin to diminish with the first failure." (Atkinson, 1957).

Change in aspiration when anxiety is dominant

The tendency to avoid (or inhibit) the performance of actions which are expected to lead to failure must be overcome by other "extrinsic" sources of positive motivation. One source of such motivation is the *need for social approval.* In a person disposed to be anxious to avoid failure, the behaviour in an achievement-oriented situation *is to be understood in terms of that which he is trying not to do.* A number of early studies of level of aspiration conducted by Sears, Rotter and others (reviewed in Lewin, *et al.*, 1944) showed that there is much greater variability in level of aspiration among anxious groups than among non-anxious ones. Setting an excessively high level of aspiration as well as a very low level of aspiration where success is virtually guaranteed is viewed as an avoidance of more realistic achievement-oriented activity. "Atypical" shifts in aspiration occur more frequently when *n* Ach is 'Low' and test anxiety 'High' than when two motives are nearly equal in strength, or when *n* Ach is dominant.

Persistence in achievement-oriented activity

Norman Feather (1960, 1961, 1962) applied the theory of achievement motivation to persistence at a task and its relationship to expectation of success. How is persistence at a task affected by both the initial subjective probability of success (that is, apparent difficulty) and the personality (Ms and MAF) of the subject? Feather states that he will continue to persist at his task so long as the motivation to perform it is stronger than the total motivation to perform the alternative available to him (Feather, 1961). In other words, the theory of achievement motivation produces the hypothesis that under certain circumstances persistence in achievement-oriented activity will be greater among more anxious individuals than among individuals who are strongly motivated to achieve. This would occur when the alternative represents an even greater threat than the activity in which the subject is currently engaged.

Expectancy × Value Theory

A review of the related literature suggests that four different theoretical statements have been essentially employed to expand the motivational variables within the framework of the Expectancy × Value theory. These are summarized in the Table below, and are :

(i) Lewin's conception of the determinants of effective force;
(ii) Tolman's conception of the determinants of the performance;
(iii) The conception of subjectively expected utility in decision theory;
(iv) The conception of the determinants of the strength of the tendency to act as shown in recent studies of achievement motivation.

It may be recalled here that there are many similarities between the different conceptions. Atkinson's conception, shown here as the Expectancy × Motive × Incentive theory of motivation, owes much to the conception developed by Tolman and Lewin.

TABLE

THE EQUIVALENCE OF CONCEPTS IN VARIOUS STATEMENTS OF AN EXPECTANCY × VALUE THEORY OF MOTIVATION

Theorist	*Context*	*Determinants of Impulse to Action*	*The Impulse to Action*
Tolman, Lewin, *et al.*,	Maze behaviour, Level of Aspiration, Decision-making	Expectancy of goal, Demand for goal, Potency x Valence	Performance Vector Force
Edwards	Economic decisions	Subjective Probability x Utility	Subjectively Expected Utility
Atkinson	Achievement-oriented behaviour	Expectancy x (Motive x Incentive)	Tendency (or Motivation)
Rotter	Social learning and behaviour.	Expectancy, Reinforcement value	Behaviour Potential

The principle which accounts for the strength of a tendency to respond in a given way completely ignores habit, the associative link between a particular stimulus situation and a response. "The subject does not do this because *it never occurs to him to do this.*" The problem of habit has been systematically ignored in Expectancy × Value formulation.

Translation of Expectancy × Value Theory into S-R language

The concept of expectancy refers to the associative link between a particular response and its consequence. The hypothesis that $Vag = Mg \times Ig$, which is normally read as "the attractiveness of a particular goal to the subject (Vag) is a multiplicative function of his capacity for enjoyment of that class of goals (Mg) and the value of the particular goal related to others of that class (Ig)", can be easily translated into S-R terms and tested.

The anticipatory goal reaction is assumed to have a selective or directive influence on instrumental behaviour. This is a fundamental idea developed in Lewin's conception of the field of forces generated by a positive valence. In contrast, Spence's conception of incentive motivation (K) states that the excitement of an anticipatory goal reaction is transmitted to all responses that are elicited in a given stimulus situation.

SOME UNANSWERED QUESTIONS

Atkinson has raised certain questions which he thinks are still to be answered for a proper understanding of human motivation. These issues mostly relate to antecedent variables, antecedents of expectancies, incentives and the strength of motives assessed by the thematic apperceptive method. These questions seem to be concerned with the problem of development of motivation. The reviewer thinks that some of these questions can be better understood with the help of the views proposed by McClelland (1953, 1958, 1961). Atkinson himself has been associated with such conceptions. McClelland's "affective arousal" model helps us to understand the strength of the motivation. The view that such motives, particularly achievement, affiliation, power, approval and dependence are socially acquired enables us to understand the process of development of motives. McClelland's magnificent summary of researches in *The Achieving Society* is instructive in this regard. There seems to be no escape from the social conditions and antecedents for the development of achievement motivation. Only such conditions are manipulable which enable social scientists to develop and further strengthen achievement motivation.

Practical vs. basic scientific orientation

Atkinson has perhaps rightly emphasized the basic scientific orientation in motivation research. This is essential to the development of concepts and theories which alone enable us to correctly understand a phenomenon. But a basic scientific orientation cannot exclude a practical-problem orientation. In fact we develop theories to enable us to tackle the problems of life and nature. Often, action-oriented programmes enrich the development of theory. Lewin, whom Atkinson has admirably re-instated in his book, supported a combination of theory and action. Burris (1958), Knob (1965) and McClelland (1961) have provided support to the view that achievement motivation can be trained, ensuring better managerial and academic performance.

Bozhovich (1962) has summarized several studies which show the intimate relationship of motives for study with the content of studies, and what is described as the "social sense" of these studies. McClelland's concept of "other-directedness" (1961) also reflects a kind of "social sense". He found "other-directedness" as an important factor along with *n* Ach in economic growth. In Atkinson's terminology this would be described as an extrinsic motivation which, along with the Ts and T-f, forms the total strength of a person's tendency. Whatever term we choose to use, these findings, and also other studies on the origin of motives, seem to give a lead for an understanding of the antecedents of certain motivational variables. Experimental programmes designed to develop or train motivation might help us to understand the process of motivation development.

Guide to further research

Atkinson himself thinks that his book is merely an introduction to motivation. Anyone who reads it would find it rewarding. It would prove not only a very useful textbook, but a guide to further research on motivation, particularly achievement motivation. Like Atkinson's earlier book (1958), the present one has also become a review of researches on achievement motivation. It is, therefore, welcome for several reasons.

PRAYAG MEHTA

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Prayag Mehta is Evaluation Officer in the Examination and Evaluation Unit, National Council of Educational Research and Training, New Delhi. Currently, he is working as Principal Investigator with the Department of Psychological Foundations in the Council.

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